US007357267B1

(12) **United States Patent**
Shimada et al.

(10) **Patent No.: US 7,357,267 B1**
(45) **Date of Patent: Apr. 15, 2008**

(54) **PLASTIC BOTTLE WITH HANDLE**

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(73) Assignee: **Yoshino Kogyosho Co., Ltd.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1294 days.

(21) Appl. No.: **09/424,056**

(22) PCT Filed: **Mar. 19, 1999**

(86) PCT No.: **PCT/JP99/01405**

§ 371 (c)(1),
(2), (4) Date: **Nov. 18, 1999**

(87) PCT Pub. No.: **WO99/48763**

PCT Pub. Date: **Sep. 30, 1999**

(30) **Foreign Application Priority Data**

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Apr. 10, 1998 (JP) 10-098637
Sep. 30, 1998 (JP) 10-292978

(51) **Int. Cl.**
B65D 23/10 (2006.01)
B65D 90/02 (2006.01)
B65D 25/28 (2006.01)

(52) **U.S. Cl.** **215/381**; 215/382; 215/398; 215/396; 215/900

(58) **Field of Classification Search** 215/398, 215/399, 900, 396, 383, 384, 381, 382; 220/752, 220/754, 761, 771, 756, 675; 16/405, 425
See application file for complete search history.

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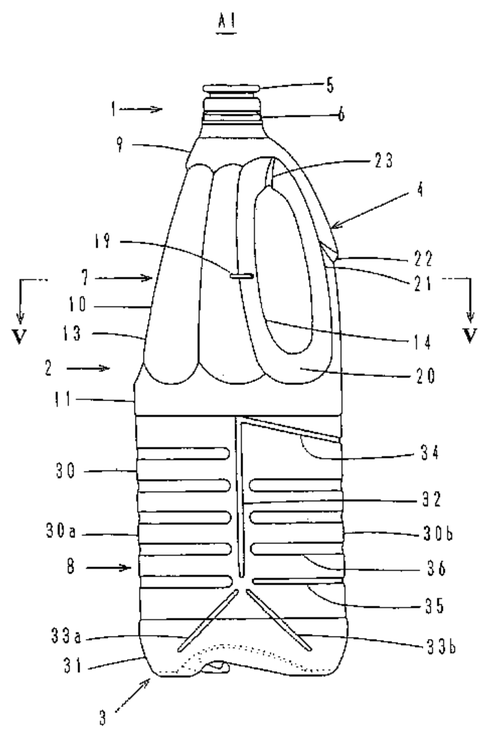
Primary Examiner—Anthony D. Stashick
Assistant Examiner—Niki M. Eloshway
(74) *Attorney, Agent, or Firm*—Oliff & Berridge, PLC

(57) **ABSTRACT**

A squeezable plastic bottle with a handle which is bendable by forming a bending deformation portion in the handle. The bending deformation portion of the handle can be a bending portion formed in the middle portion of the longitudinal direction of the handle. Further a bending rib can be formed between the handle and the body wall surface. The body may be squeezable and deformable by forming a bending rib in the bottle body.

18 Claims, 42 Drawing Sheets



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JP	11 292082	*	10/1999

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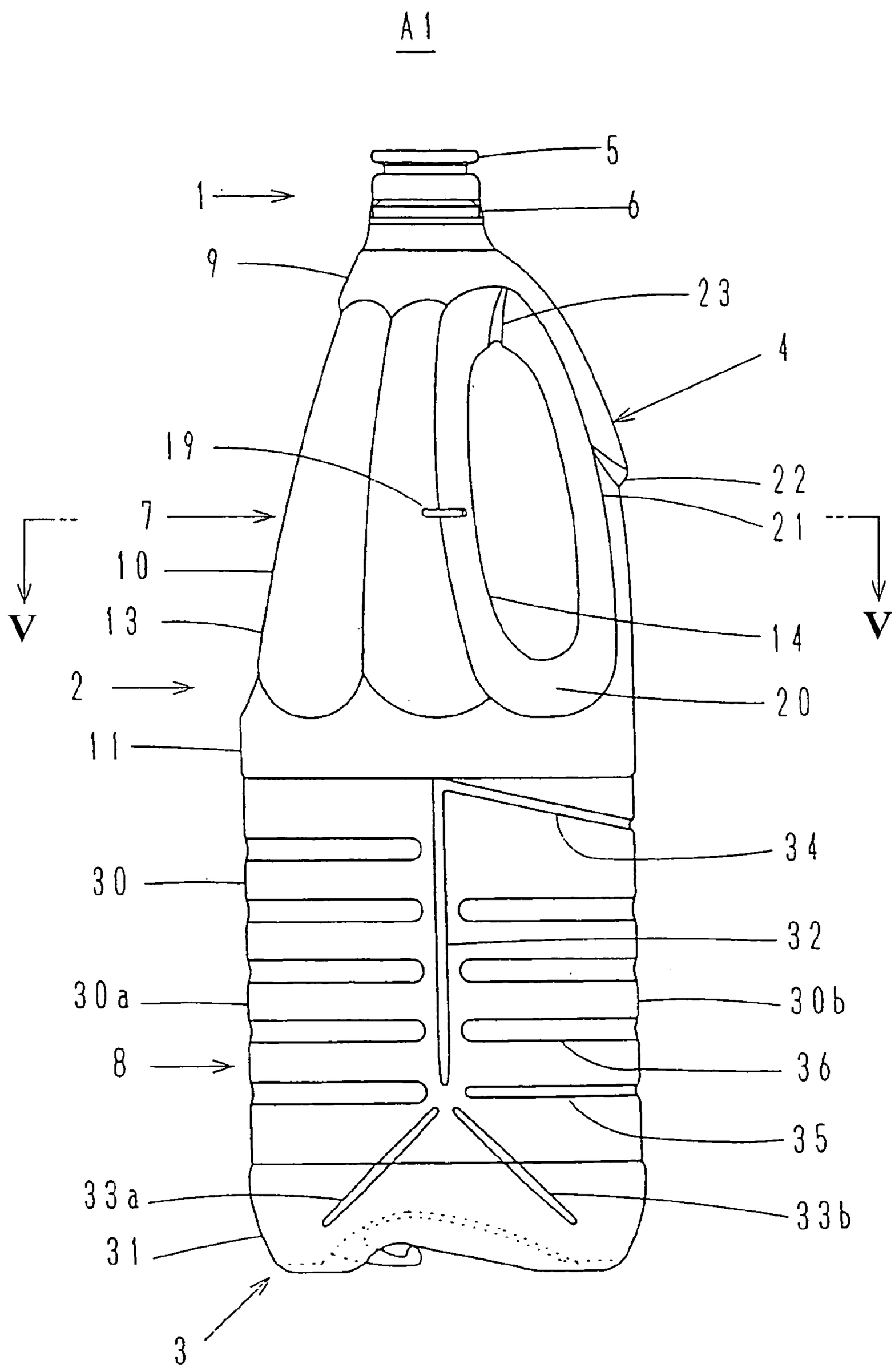
FIG. 1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32
30a
30b
8
36
35
33a
33b
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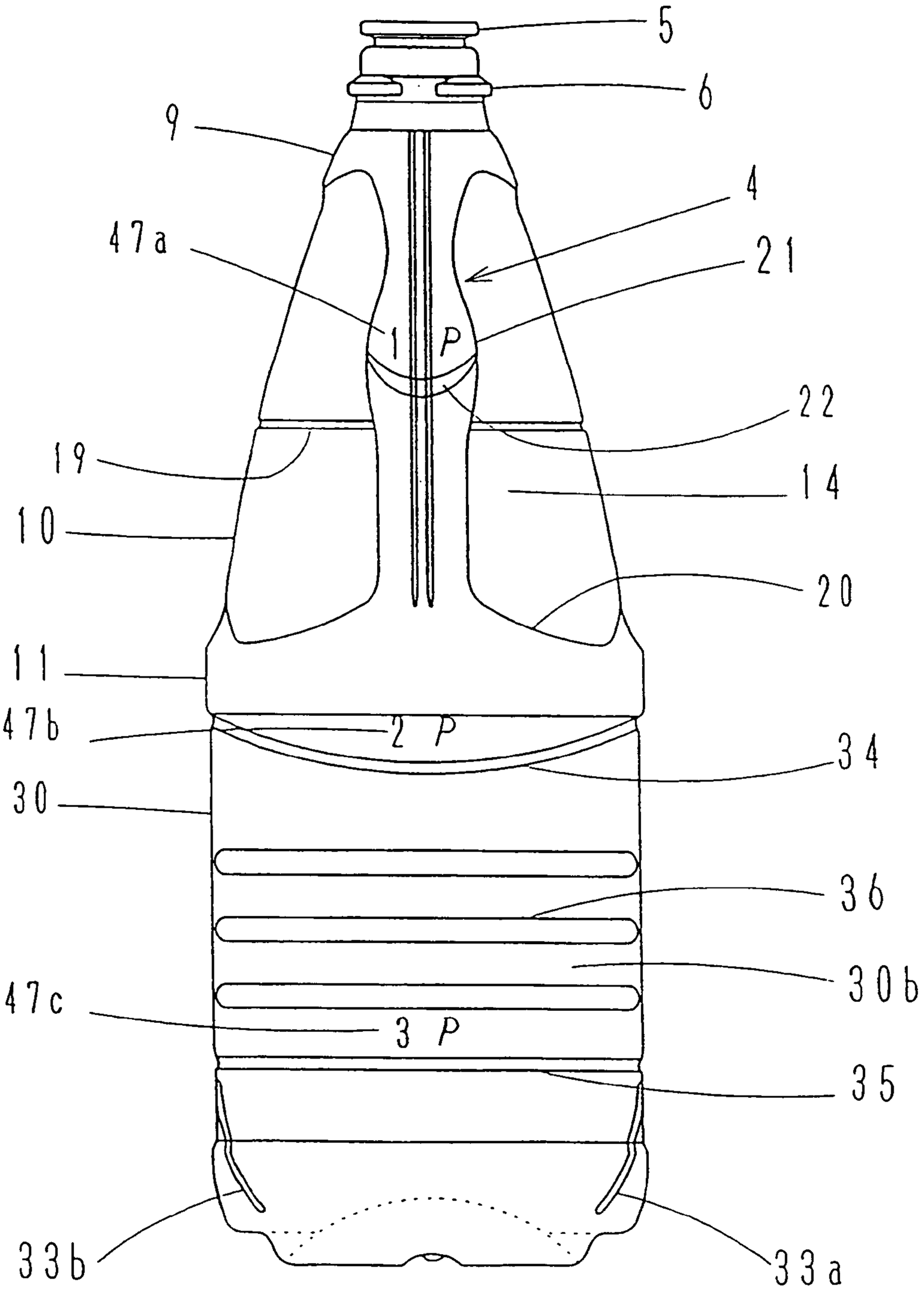
3

FIG. 2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19
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47b
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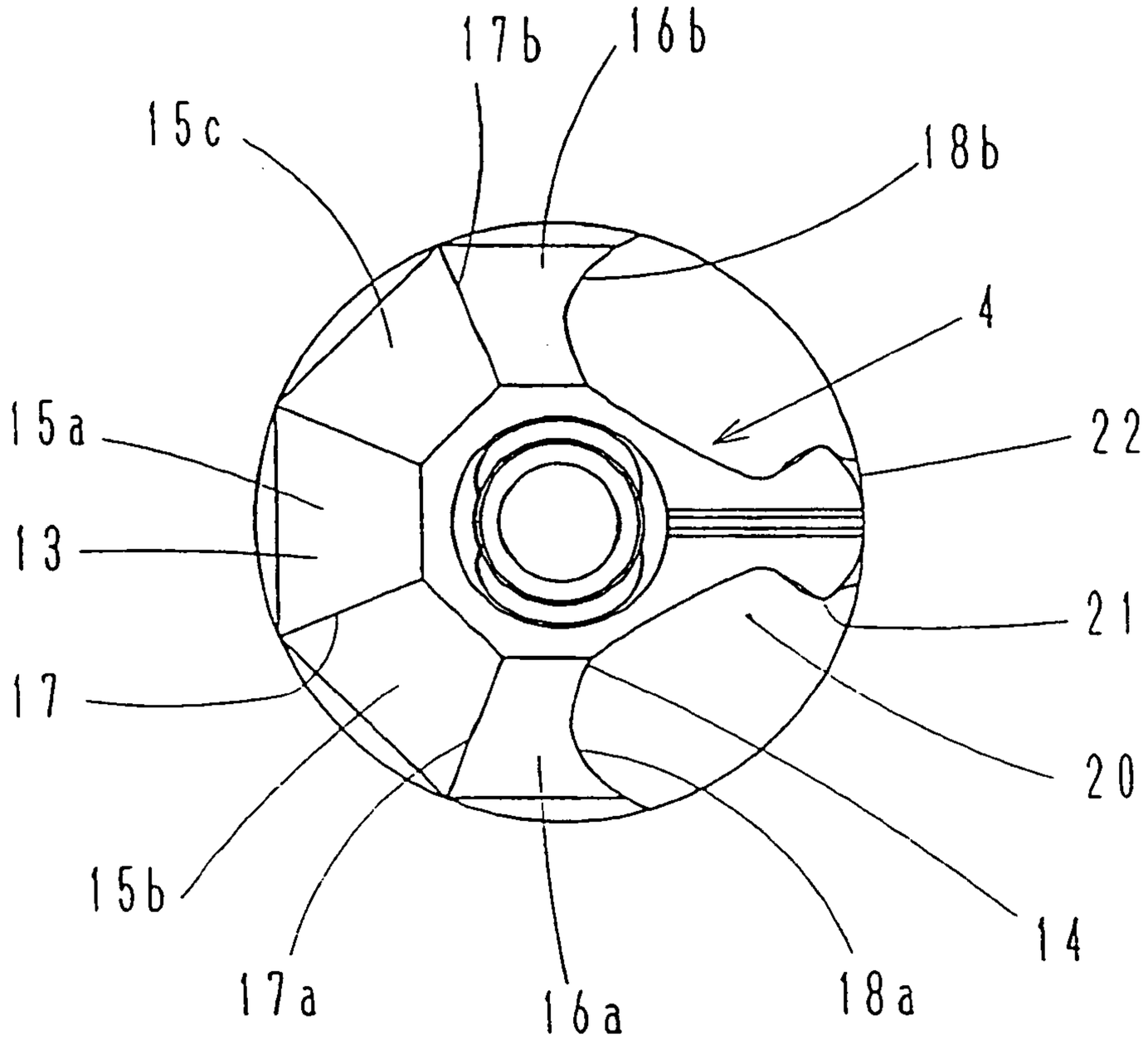
30b
47c
3
P
35
33b
33a

FIG. 3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15b
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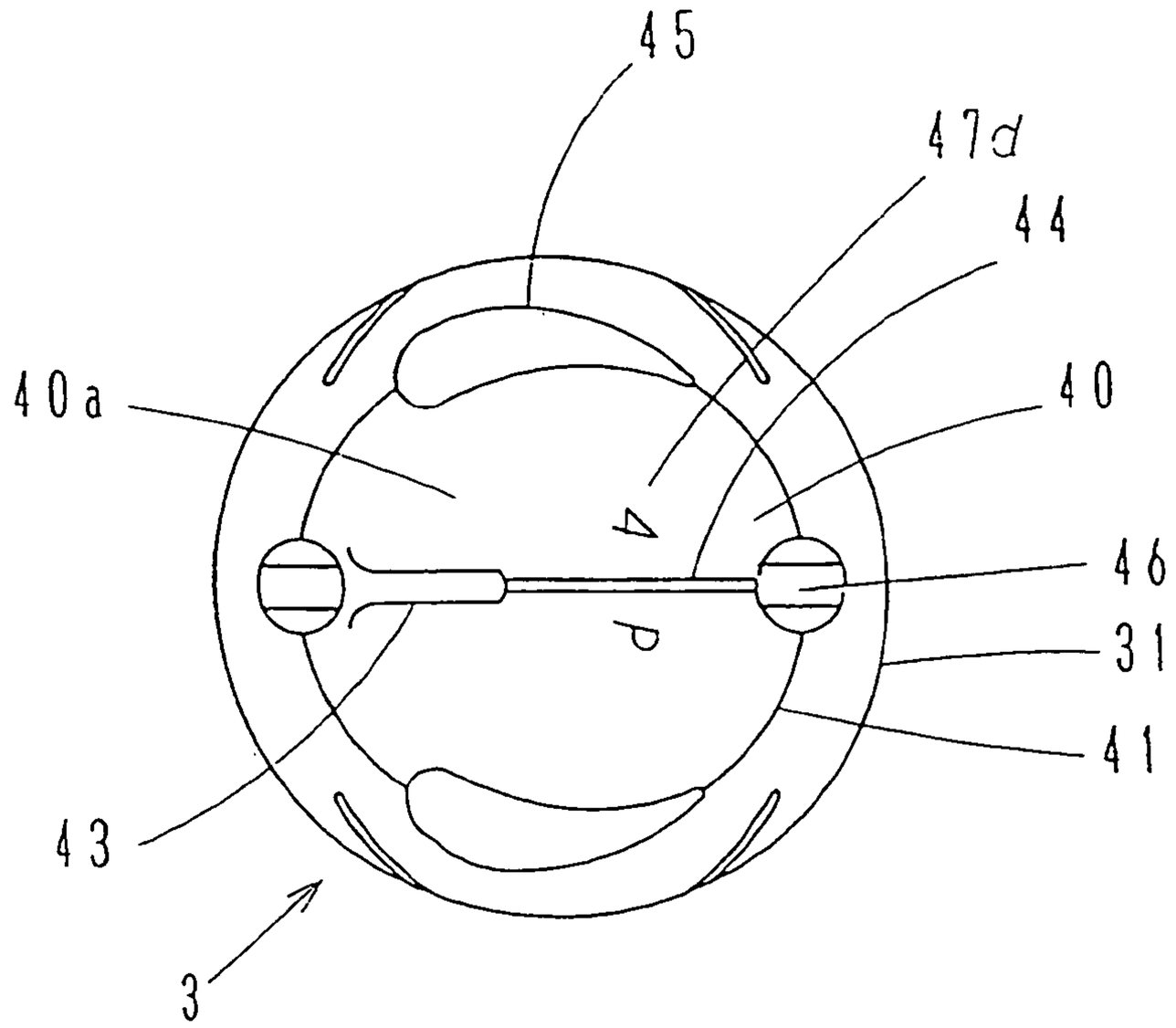
17a
16a
18a

FIG. 4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40a
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d
31
41
43
3

FIG. 5

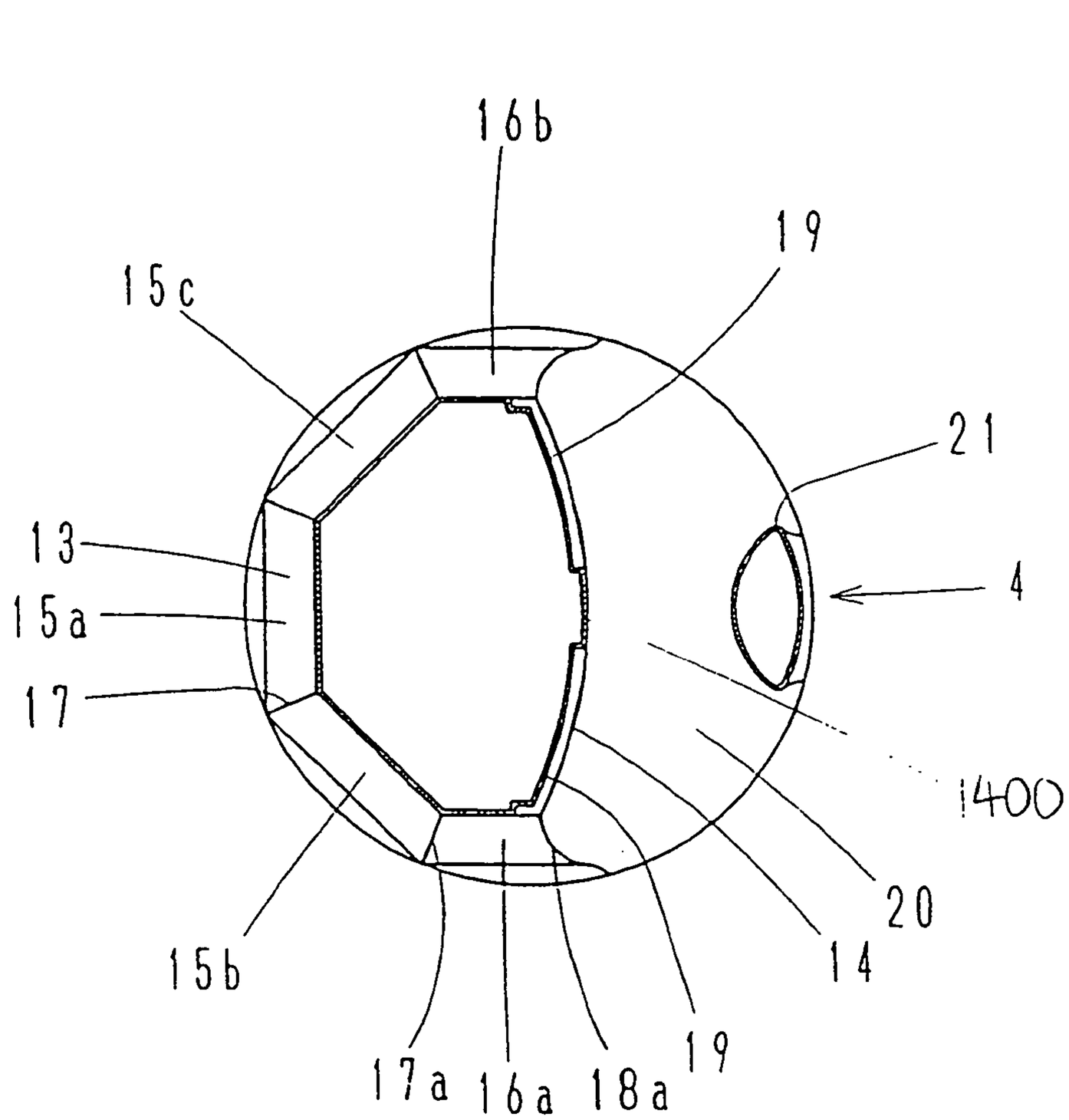
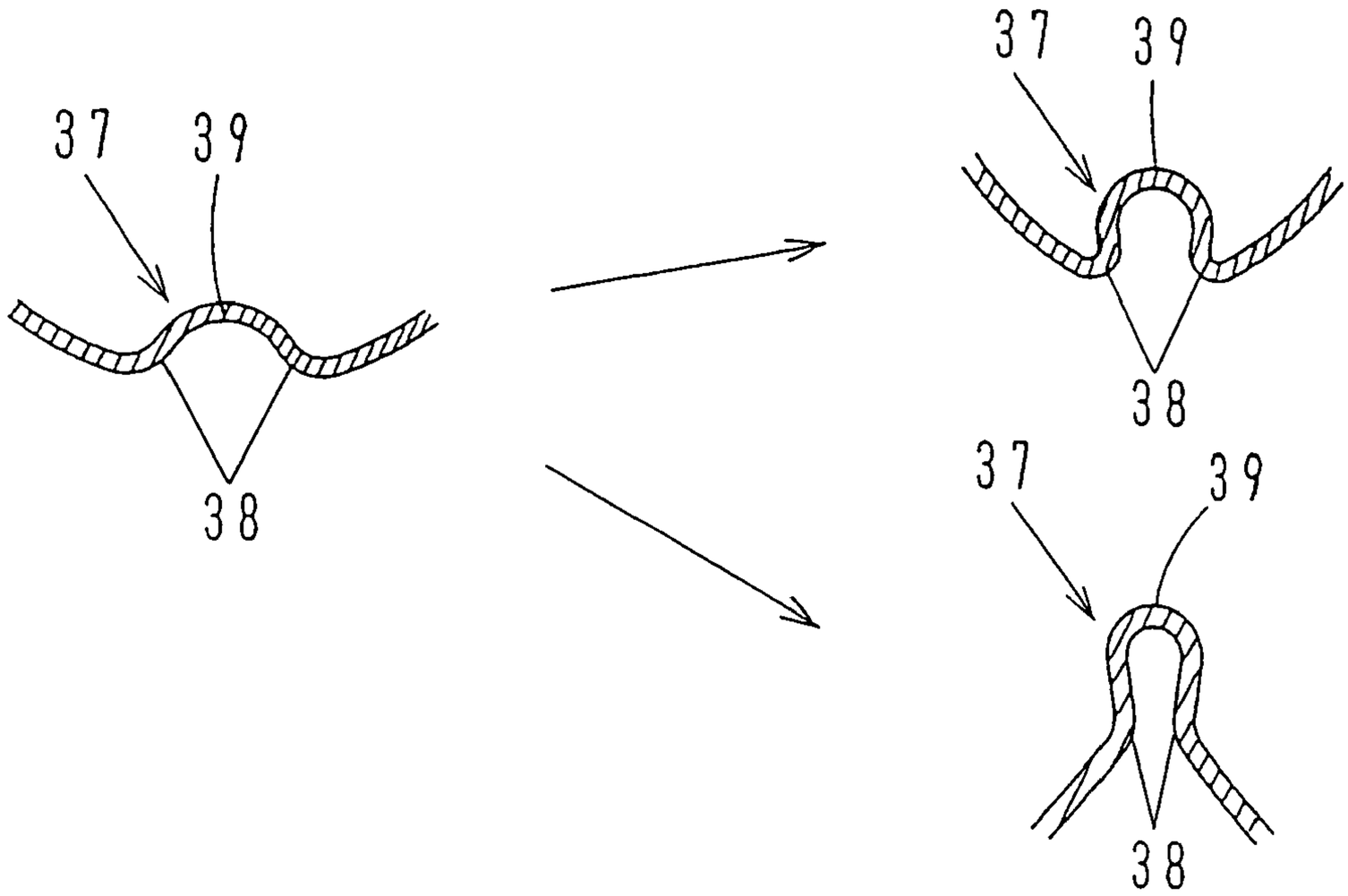


FIG. 6



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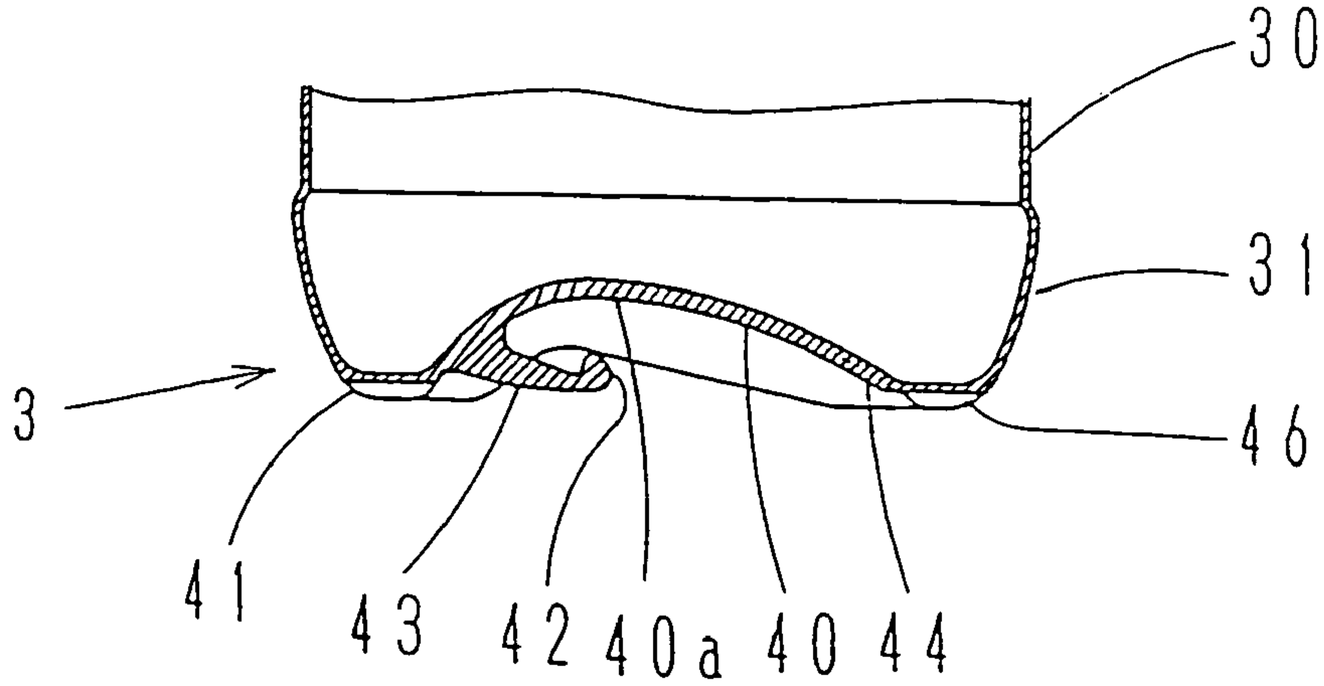

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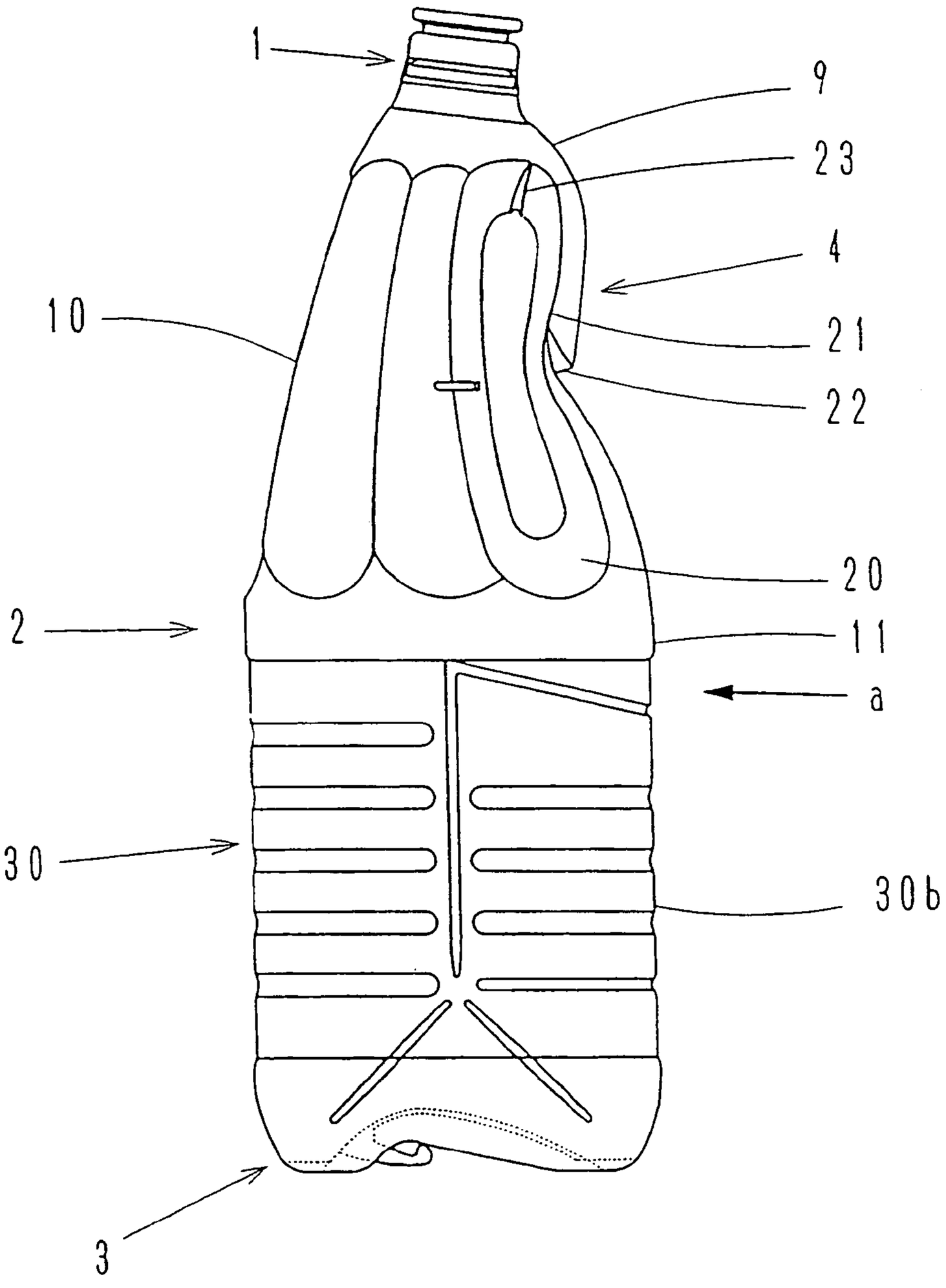


FIG. 9

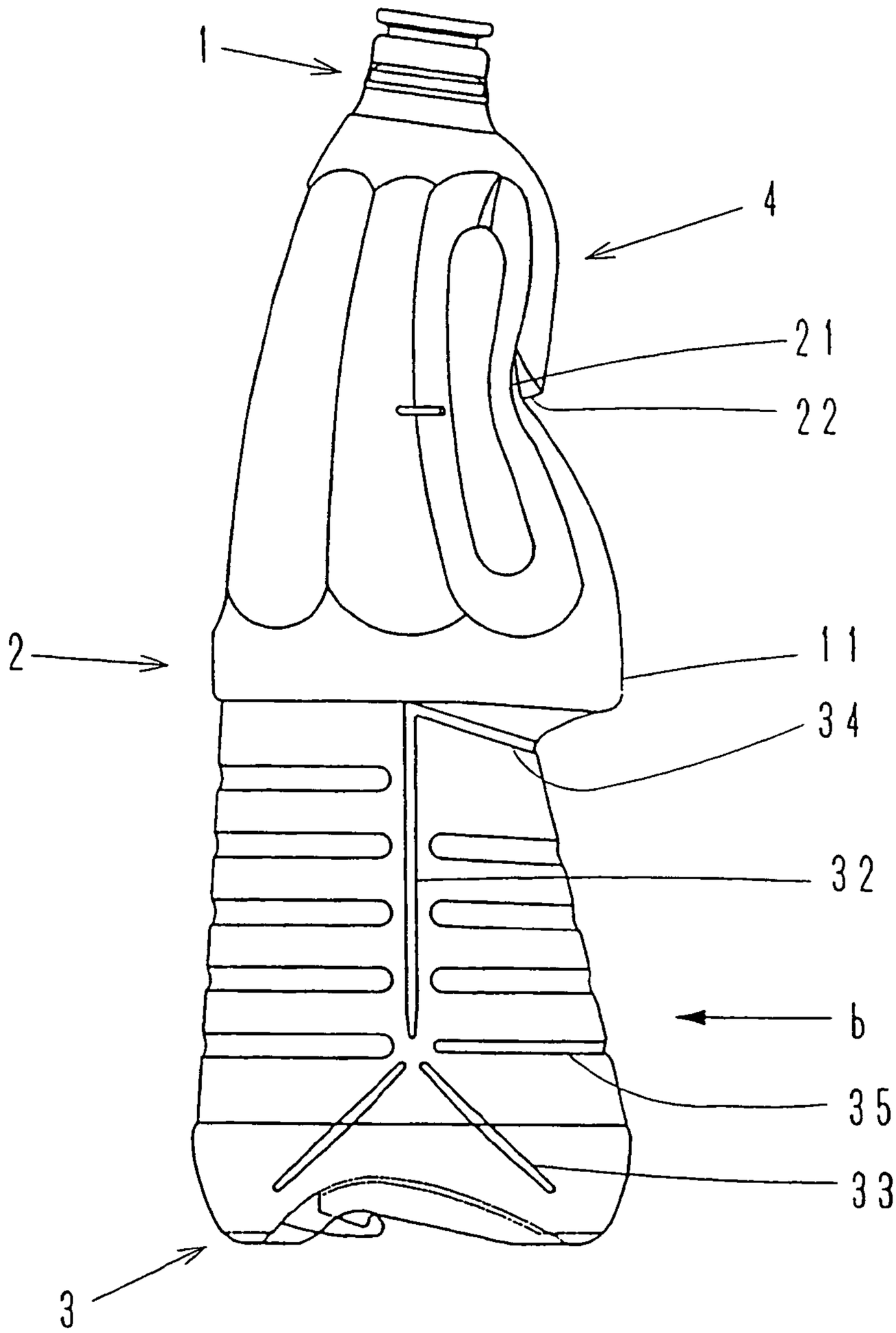
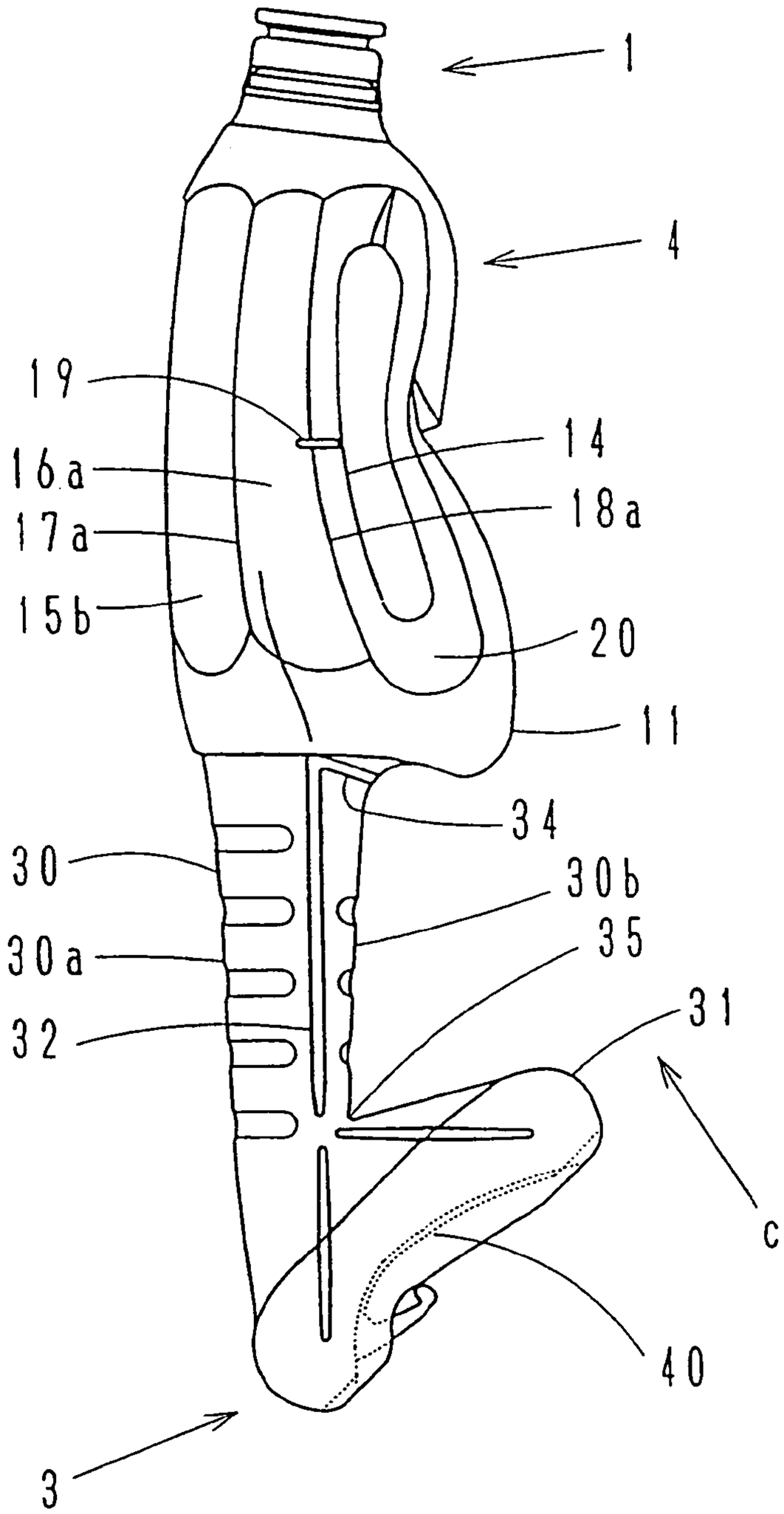


FIG. 10



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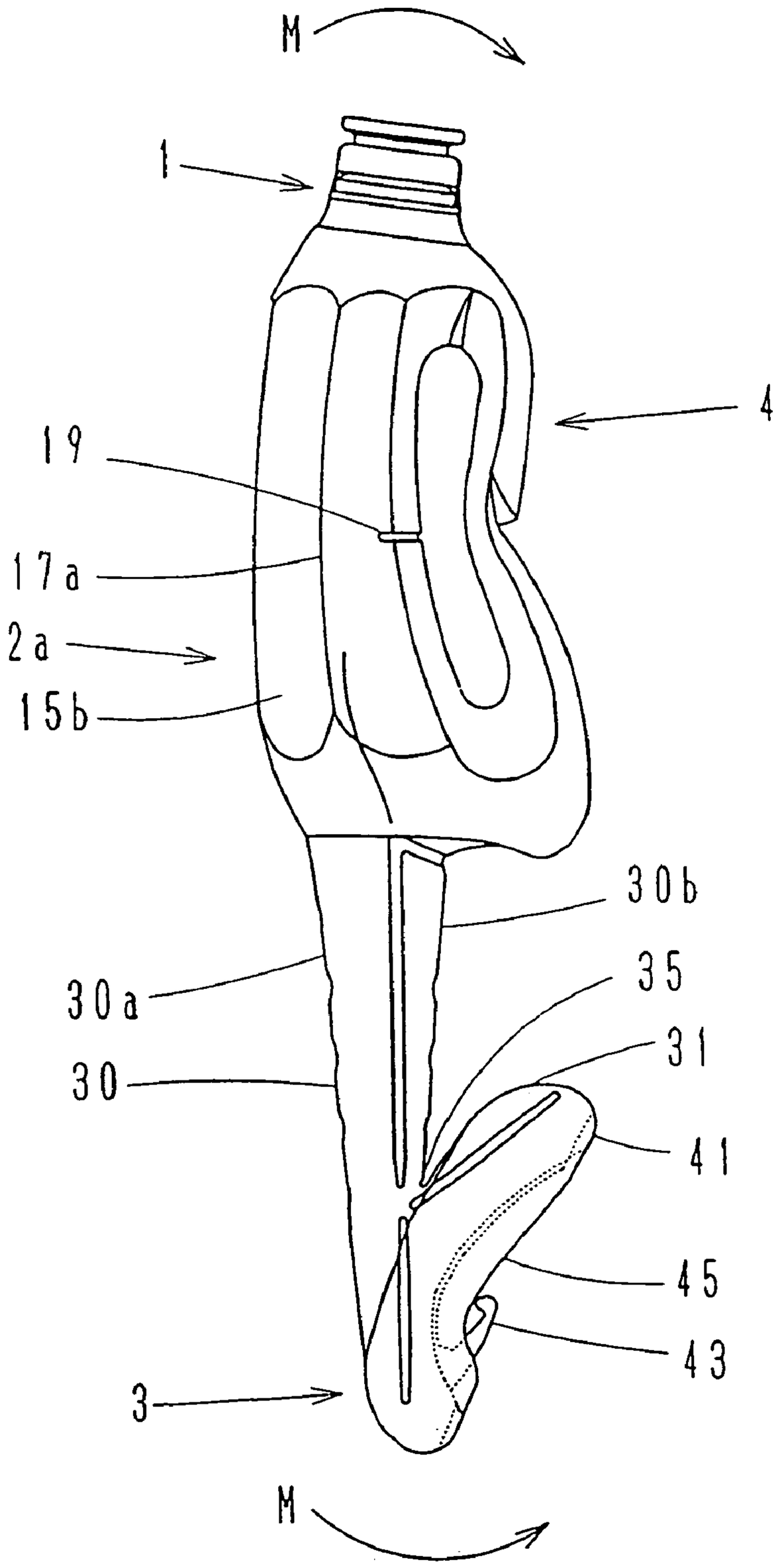
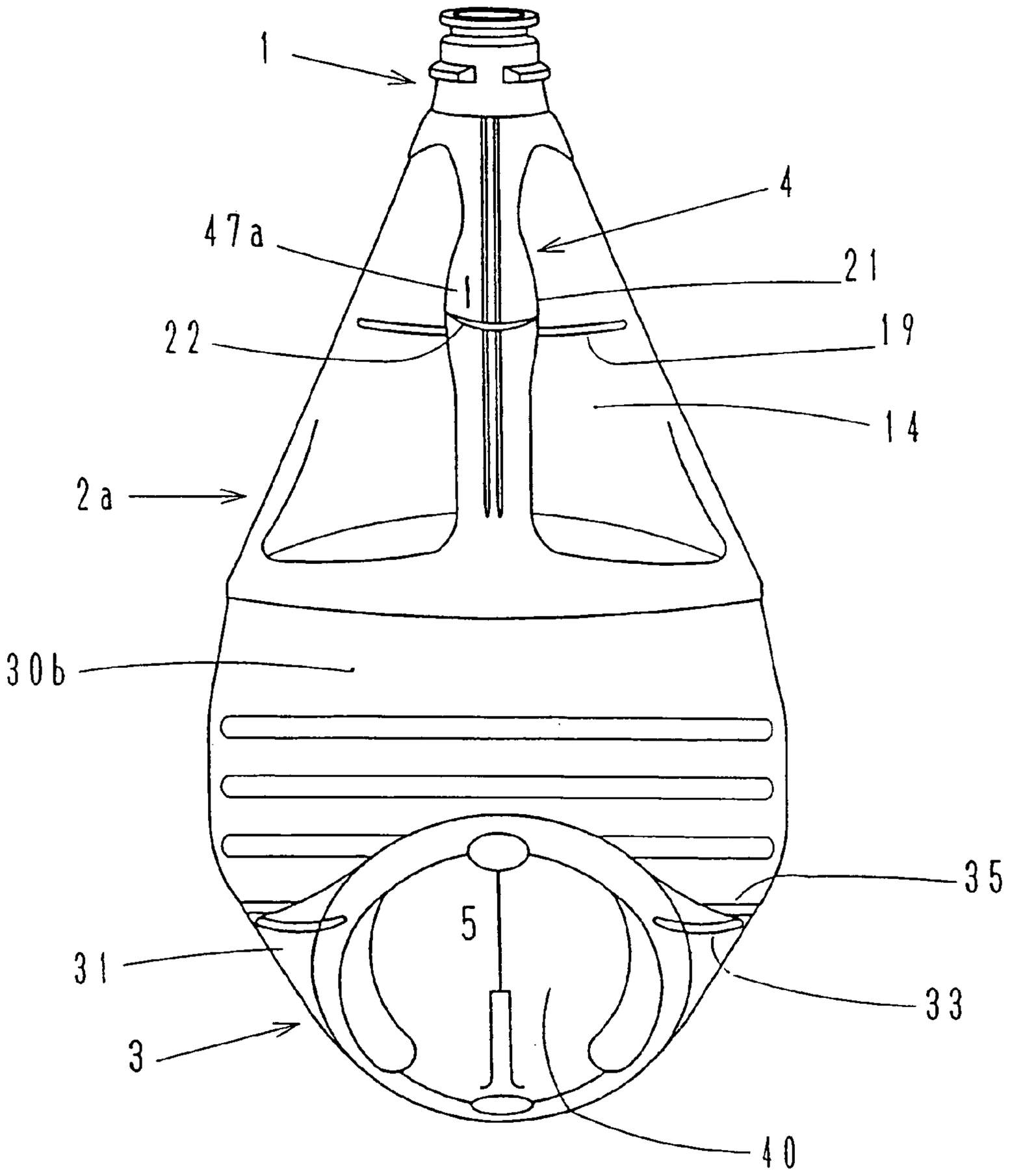


FIG. 12



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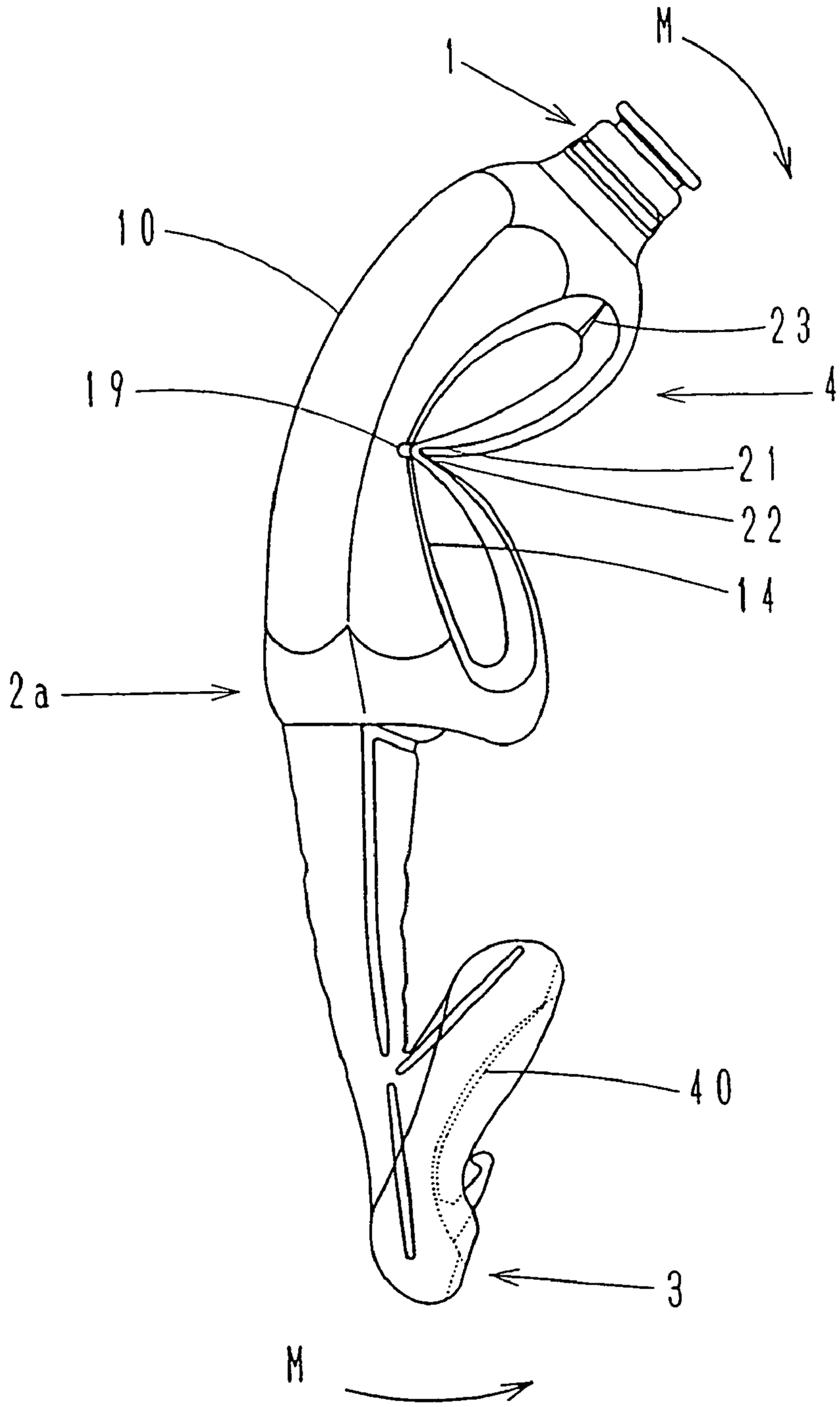
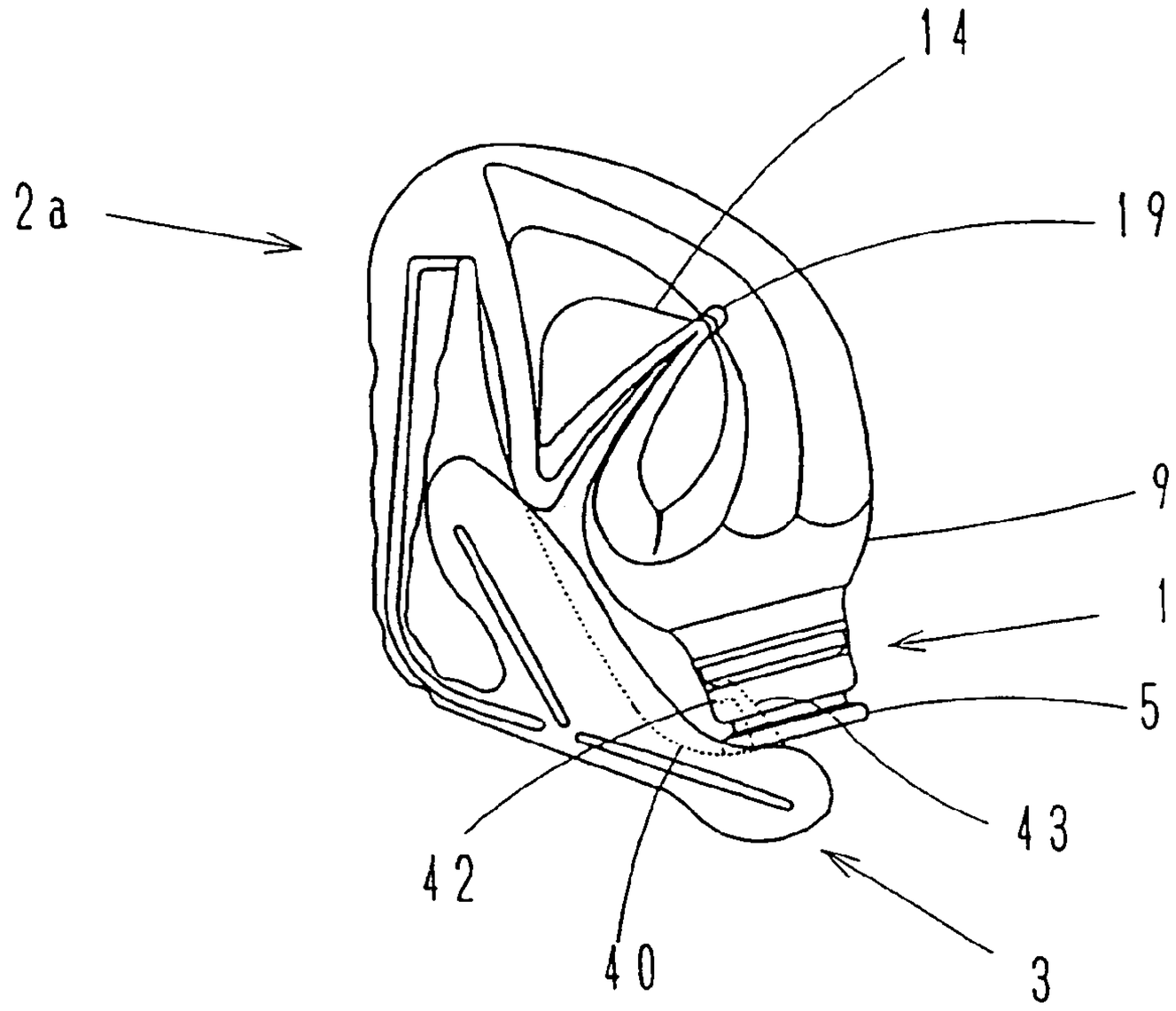


FIG. 14



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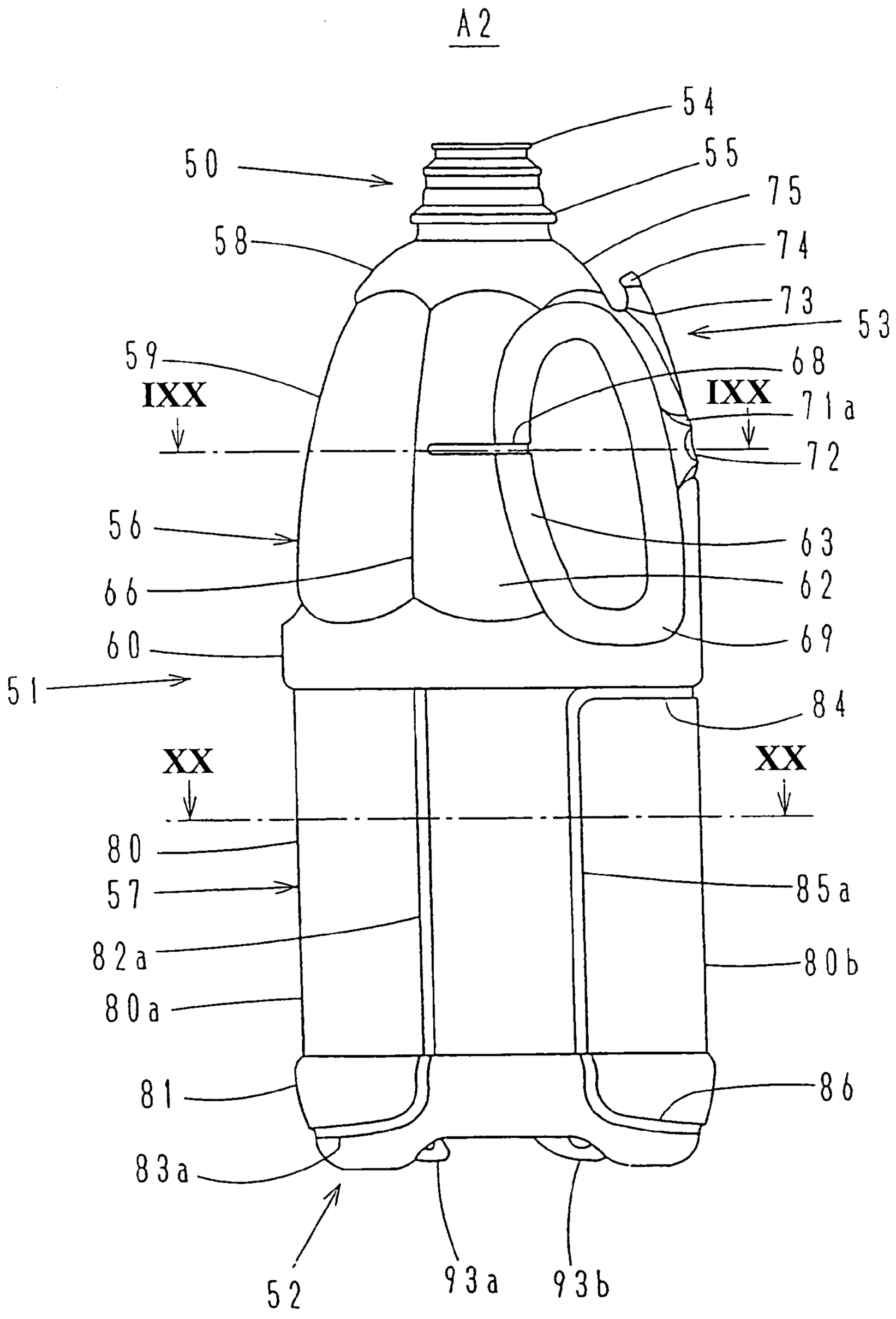
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59
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IXX
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72
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63
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62
60
69
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82a
80b
80a
81
86
83a
52
93a
93b

FIG. 16

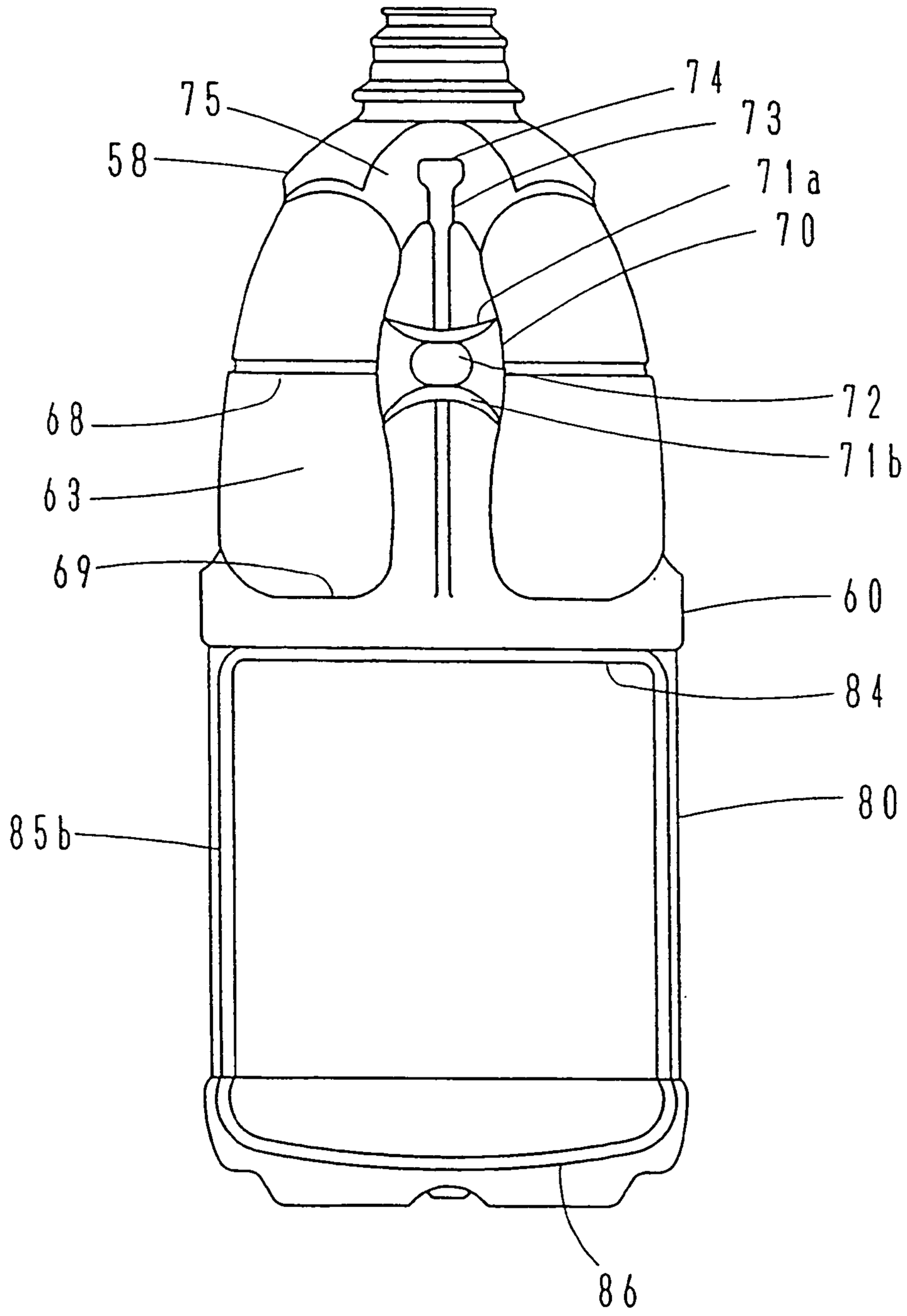
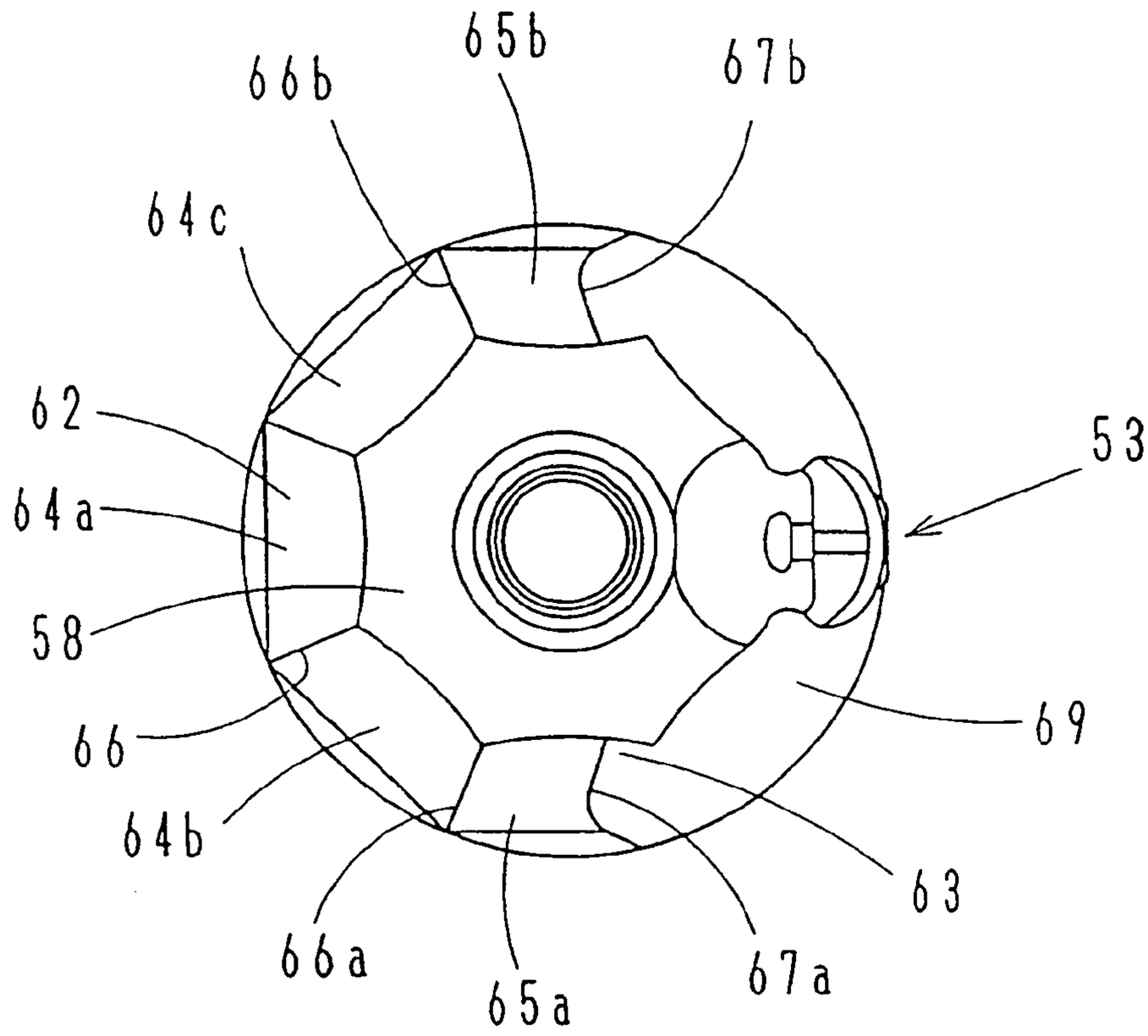


FIG. 17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64a
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64b
66a
65a
67a
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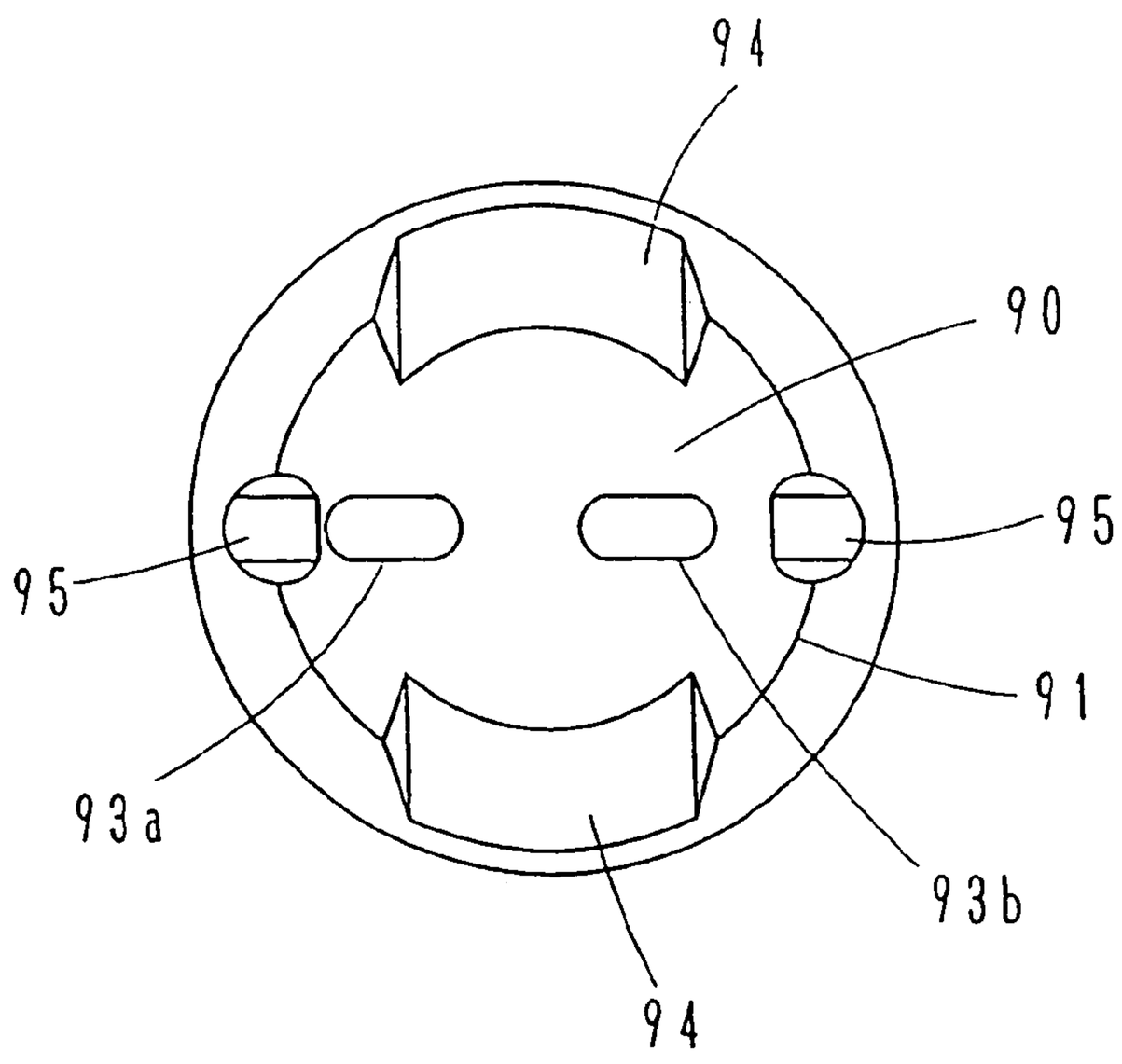
69
53

FIG. 18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95
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93a
93b
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FIG. 19

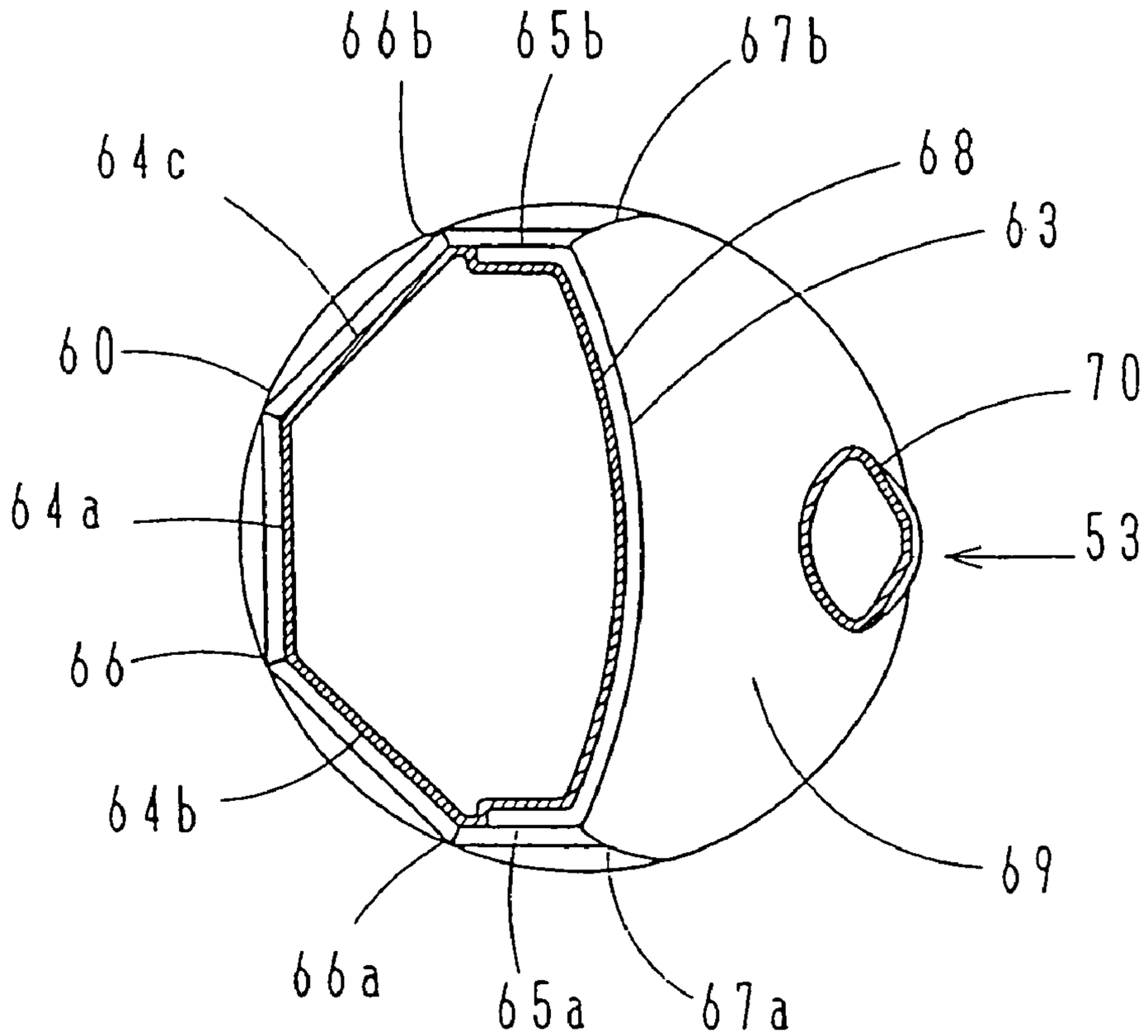


FIG. 20

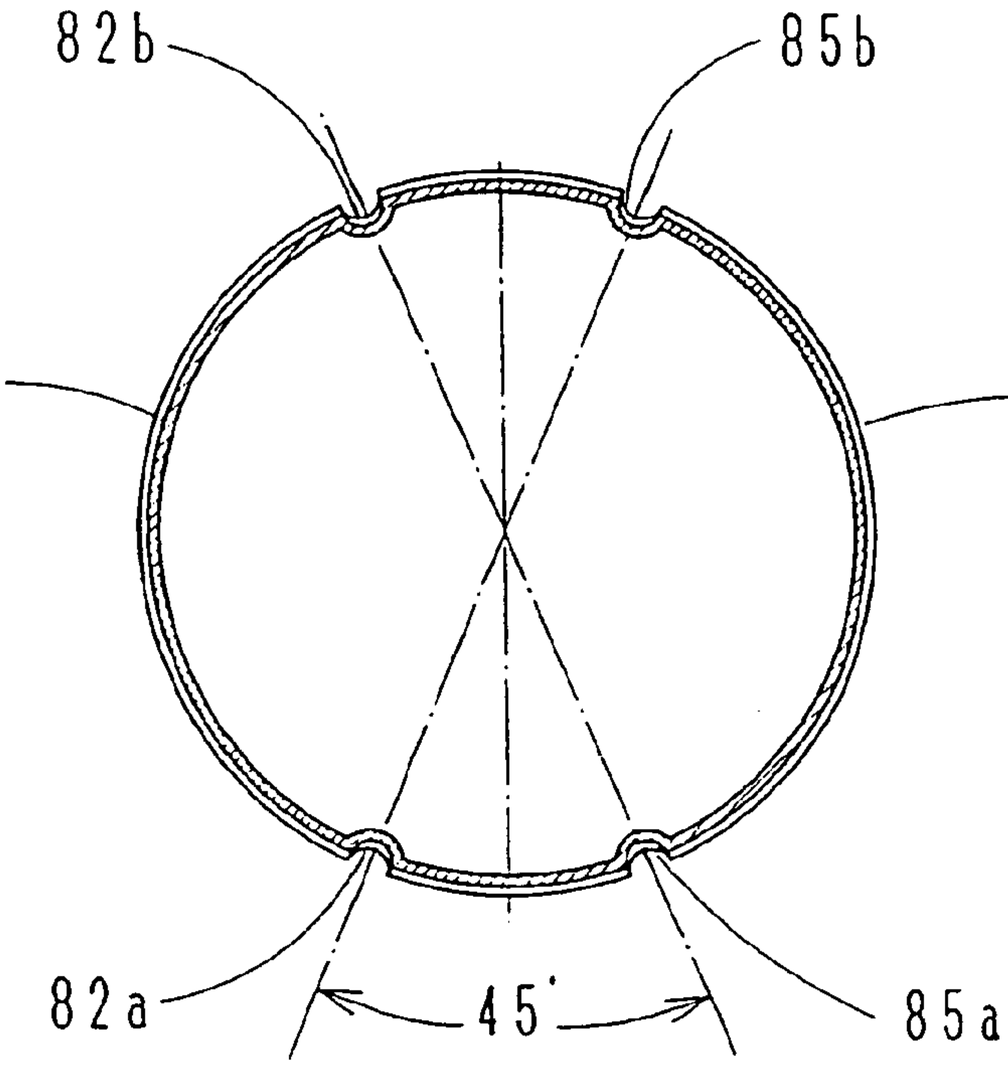


FIG. 21

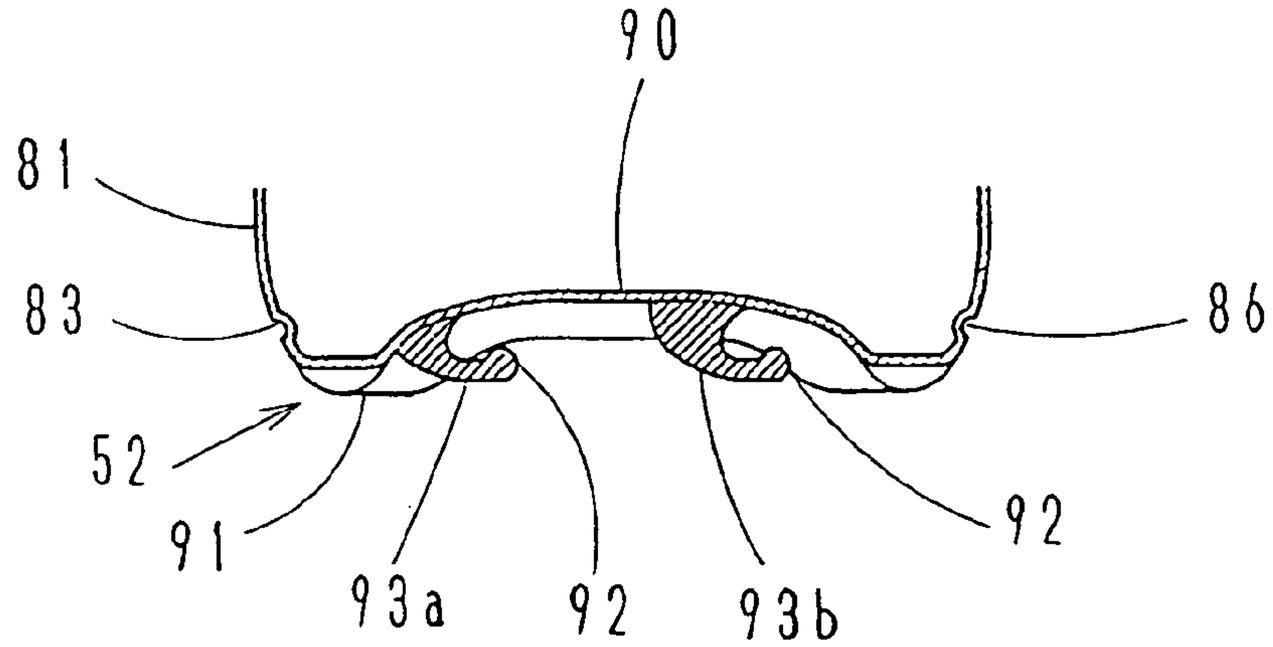
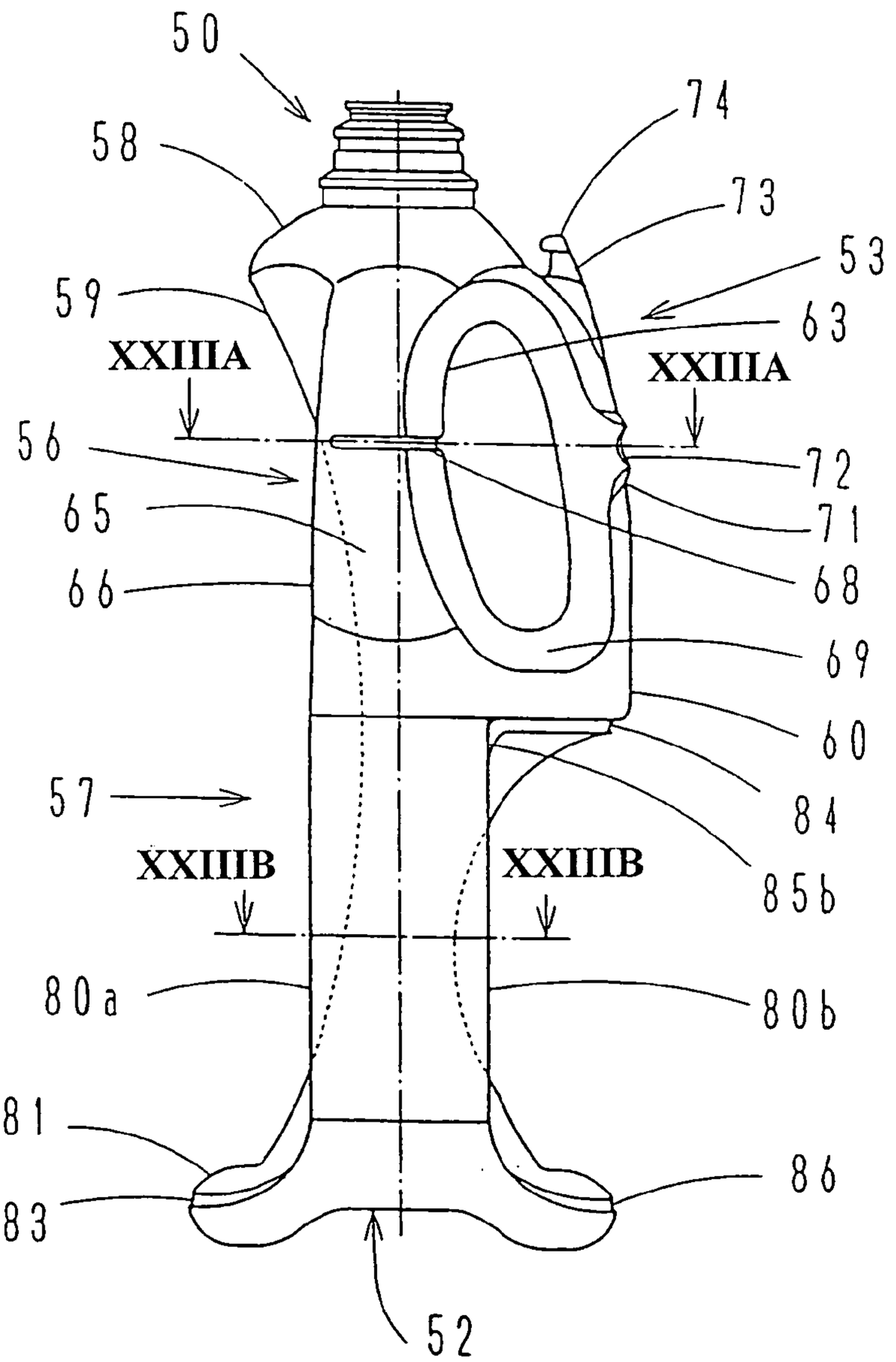


FIG. 22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80b
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86
83
52

FIG. 23A

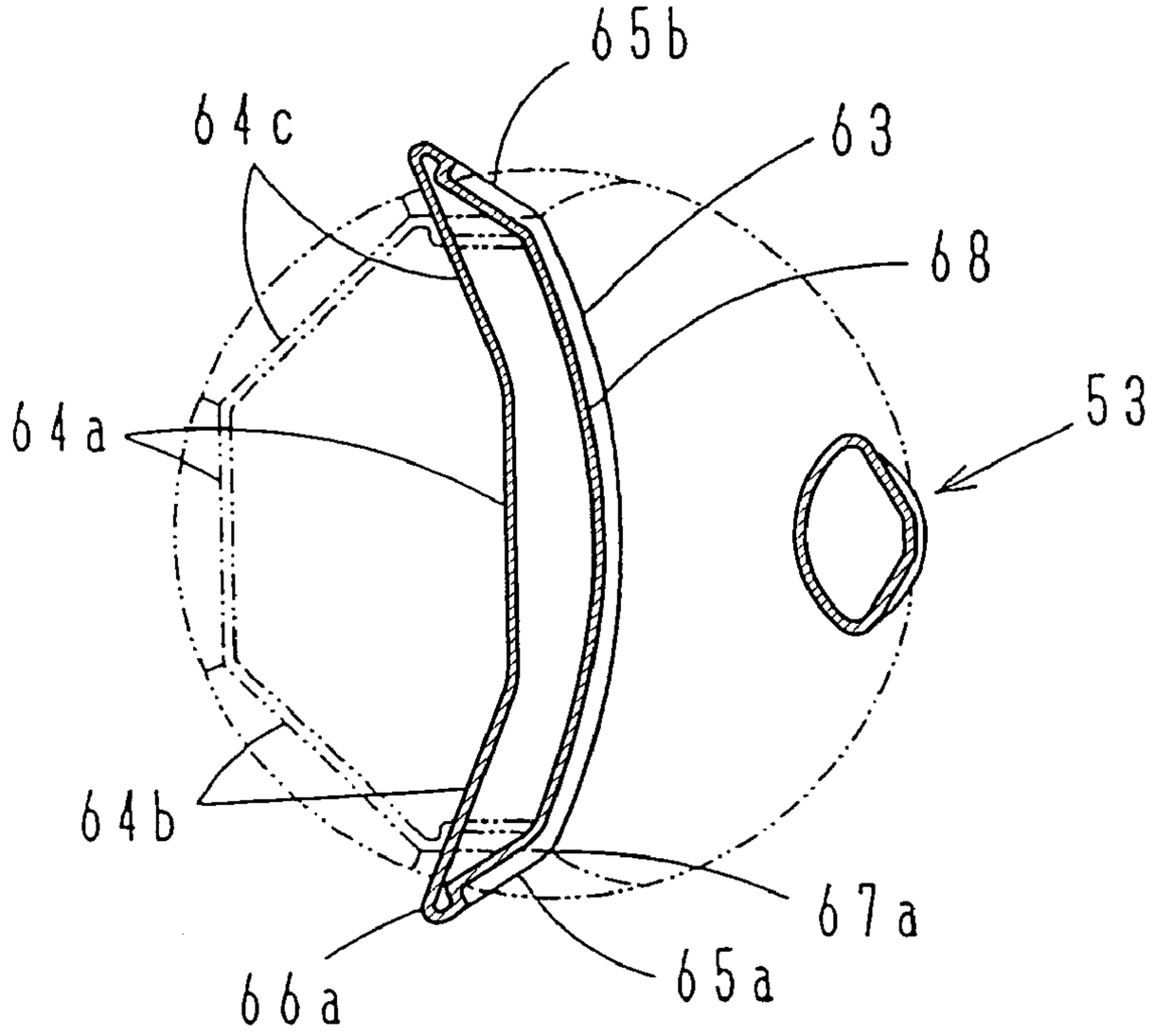
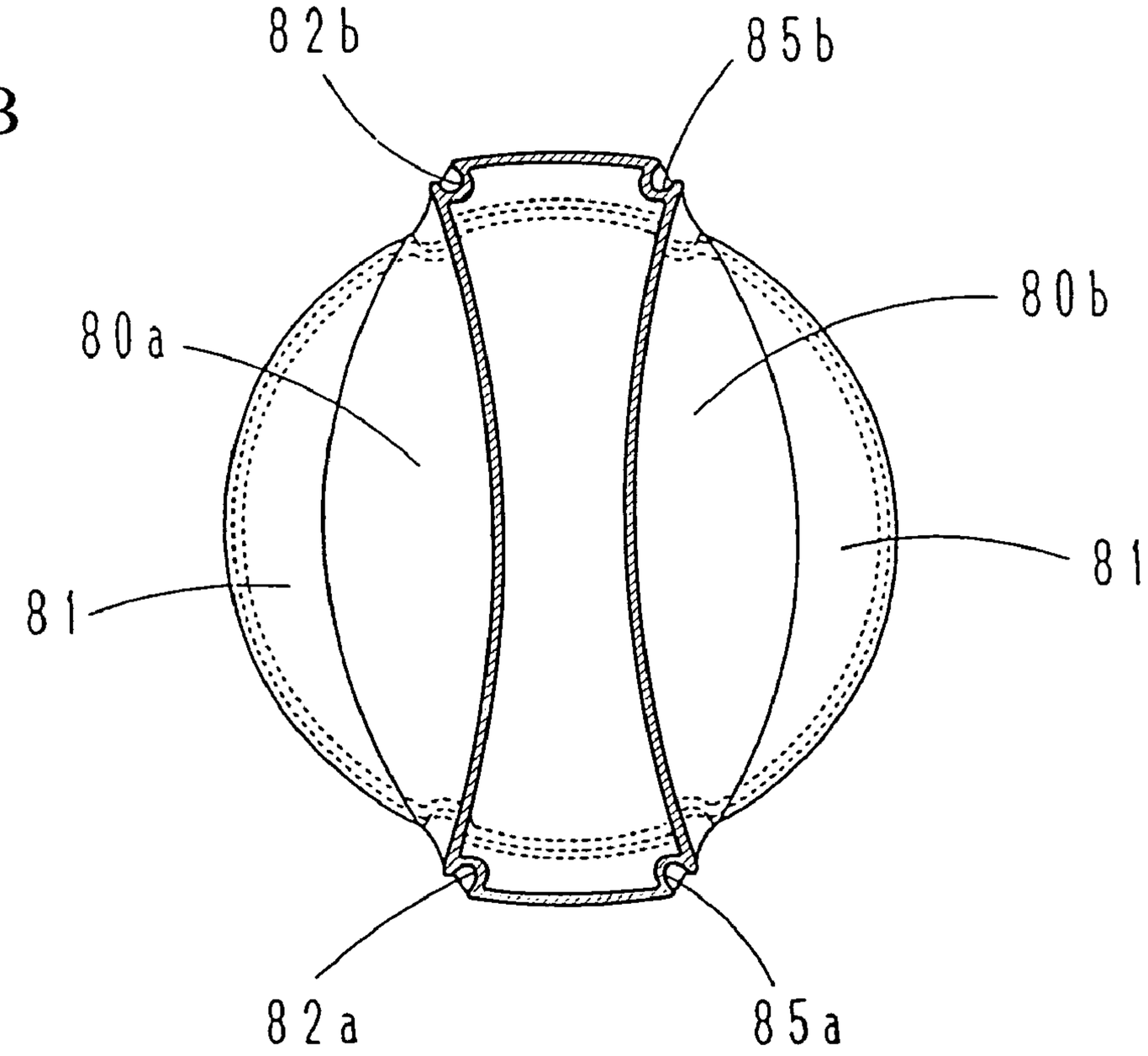


FIG. 23B



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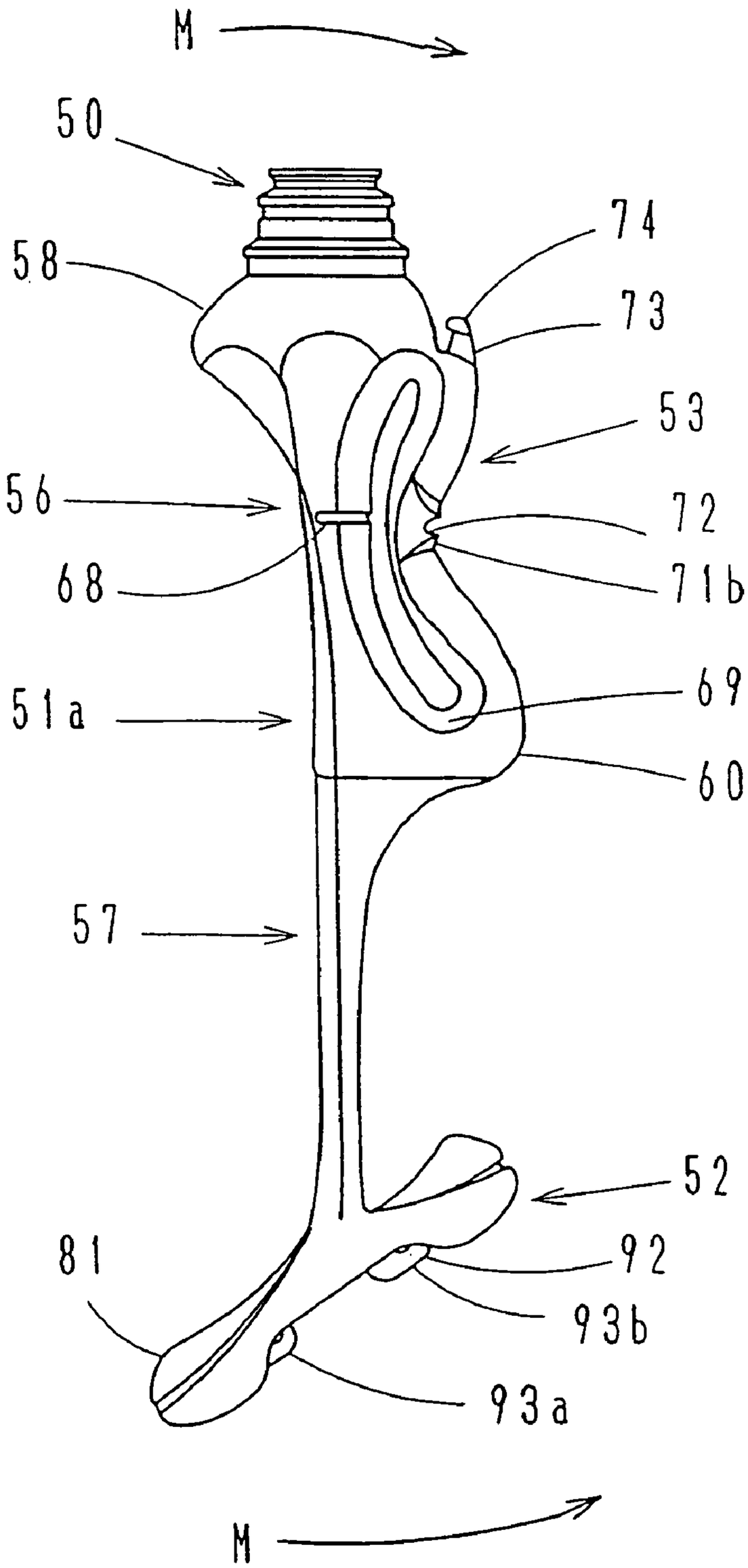


FIG. 25A

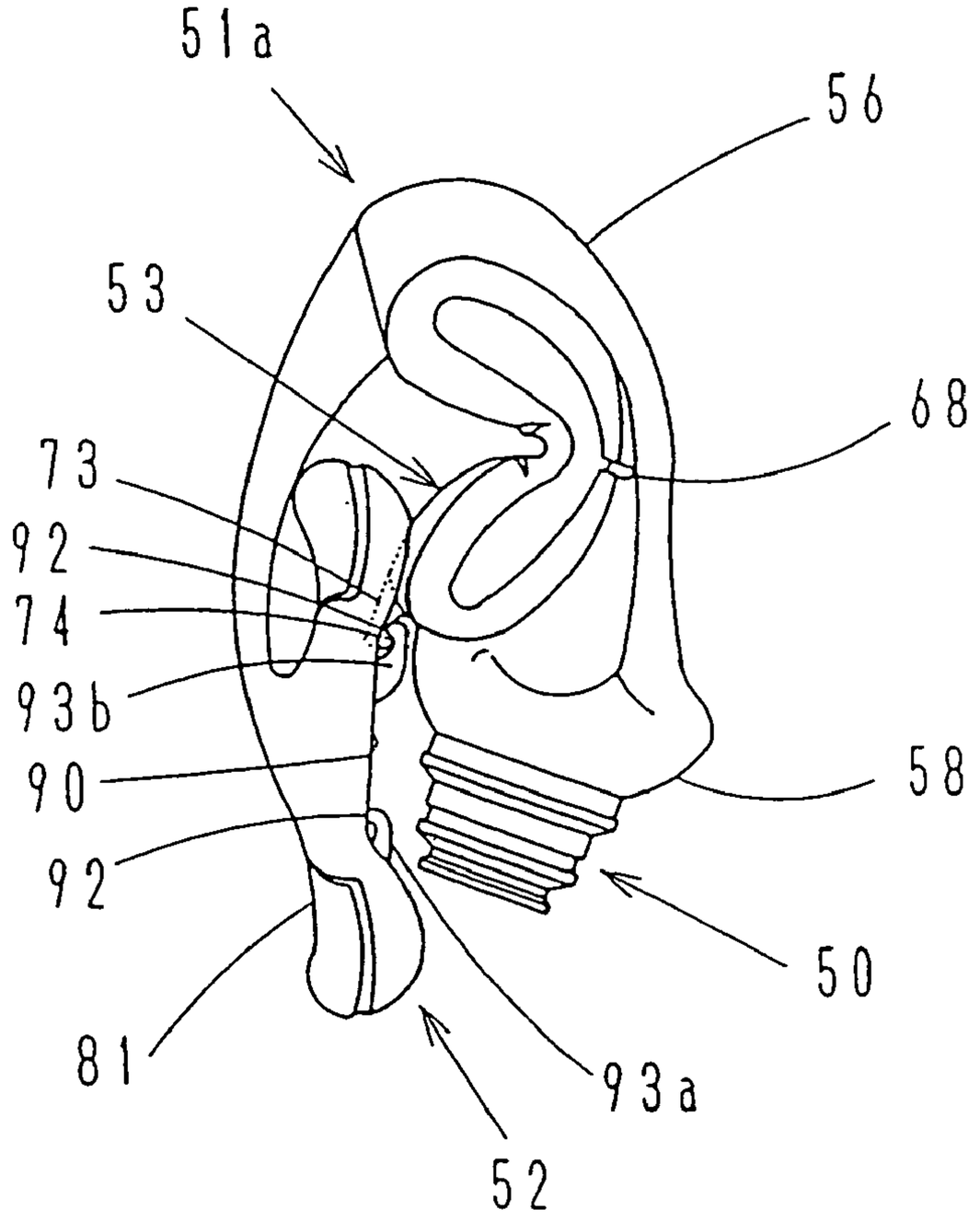


FIG. 25B

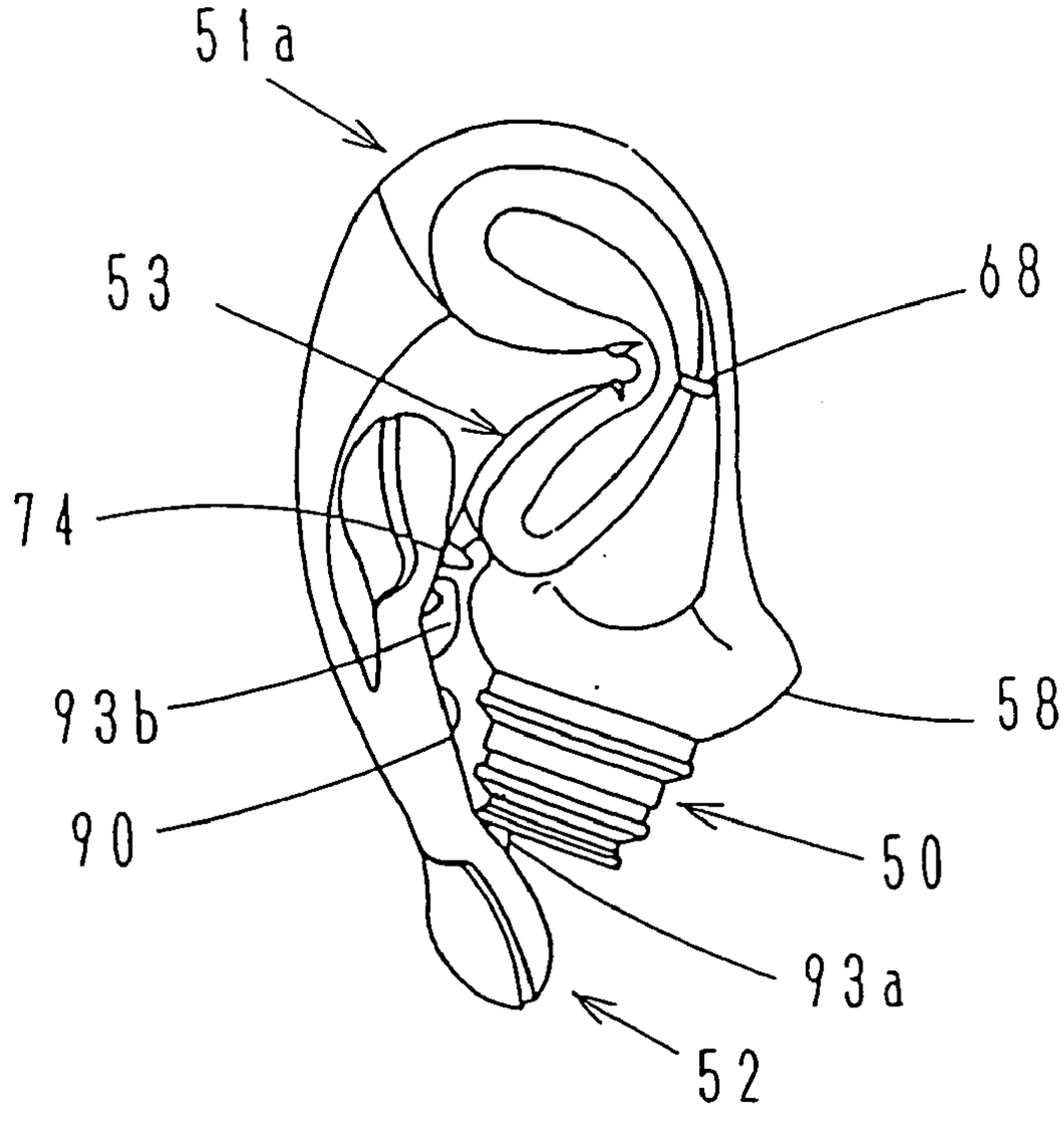
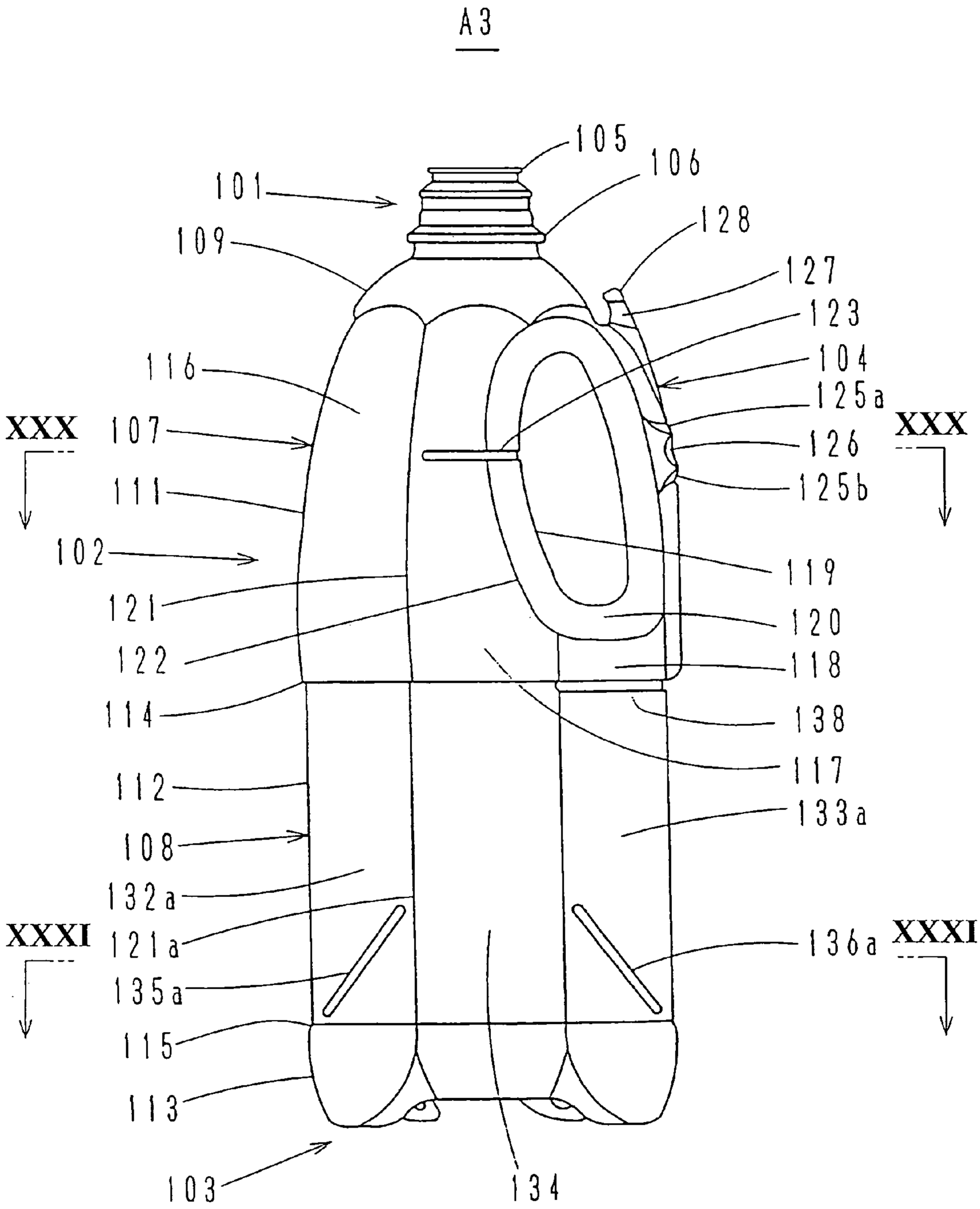


FIG. 26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122
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XXXI
135a
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103
134

FIG. 27

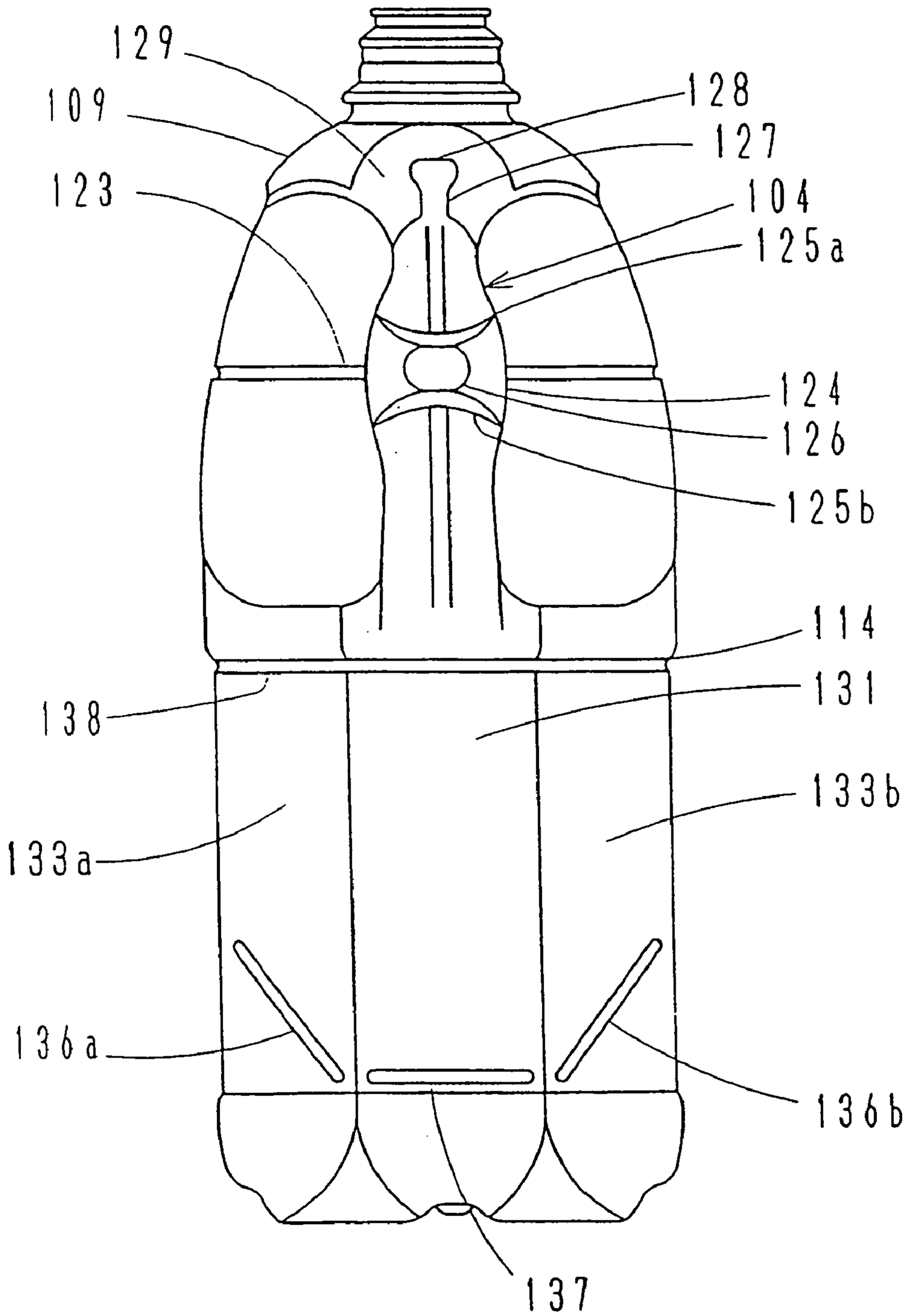
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FIG. 28

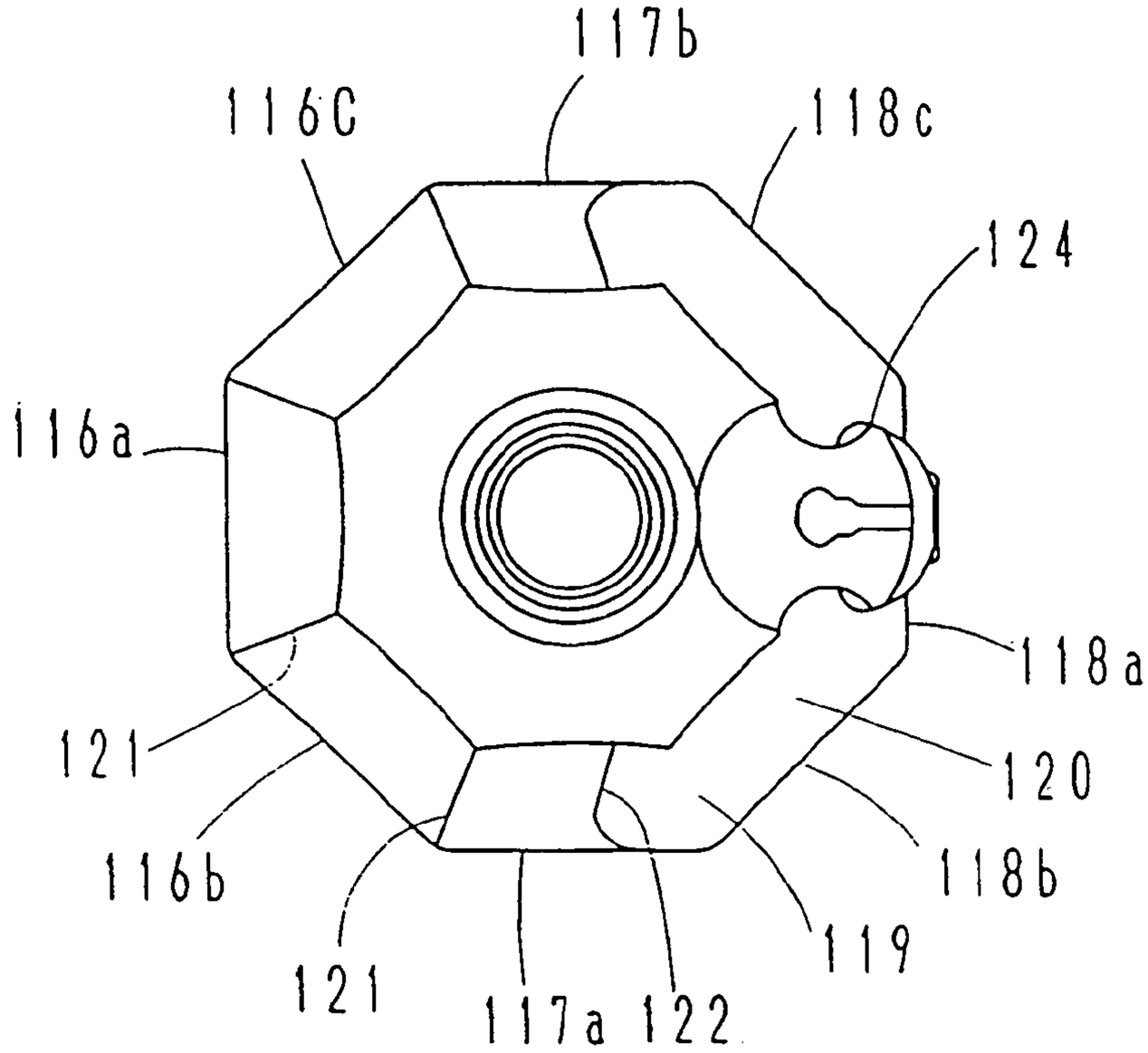
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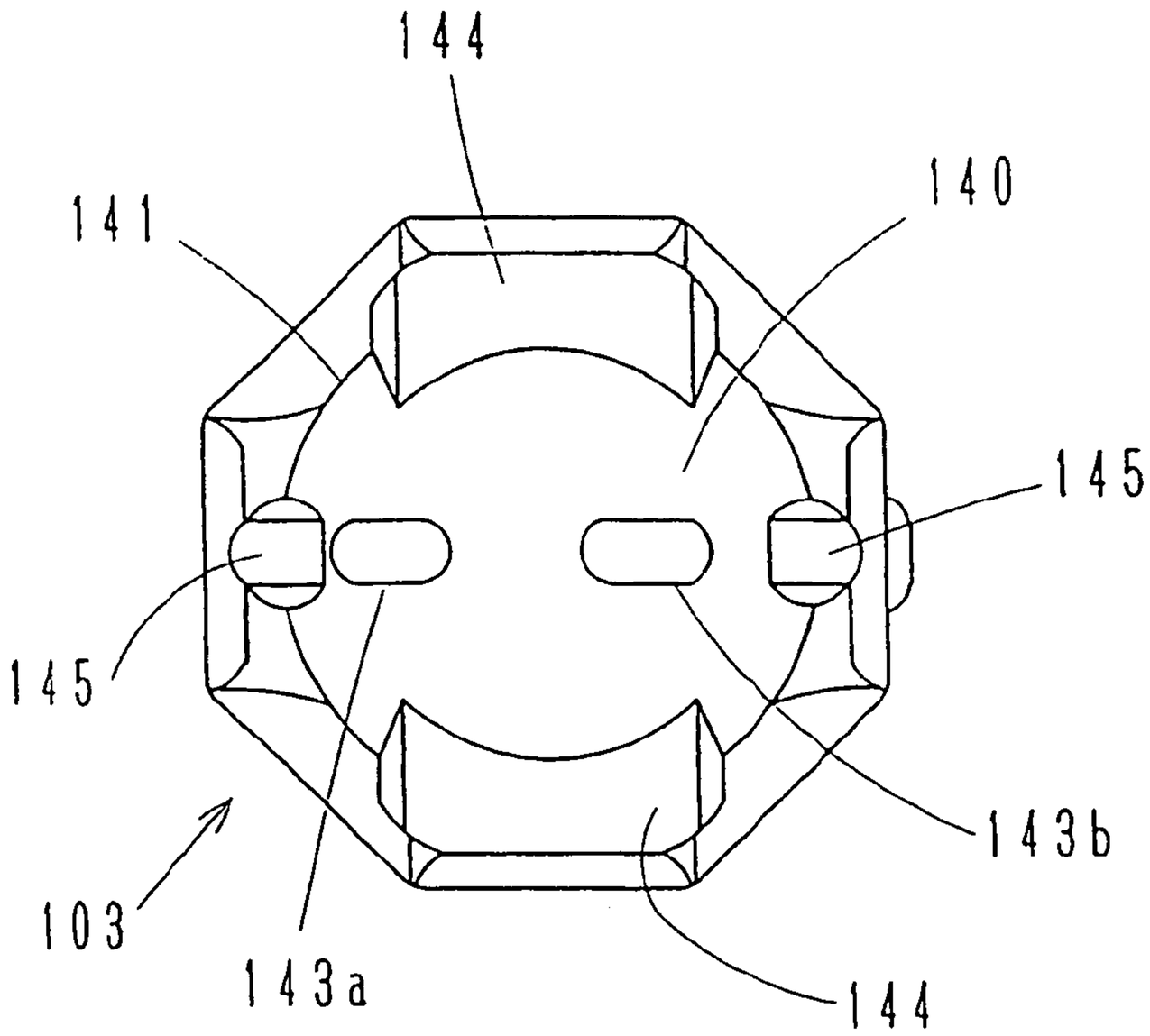
FIG. 29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143b
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143a
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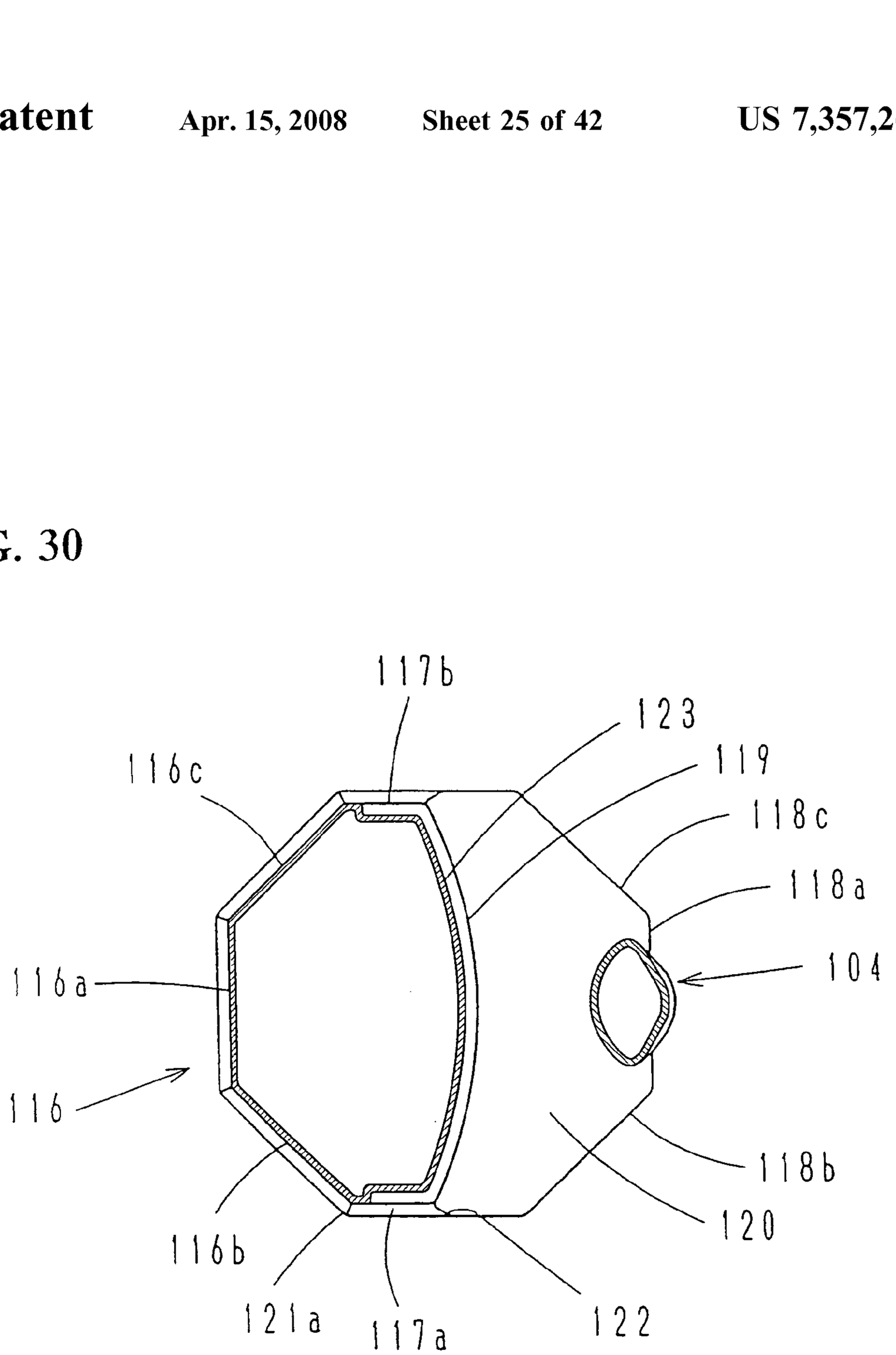
FIG. 30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121a
117a
122

FIG. 31

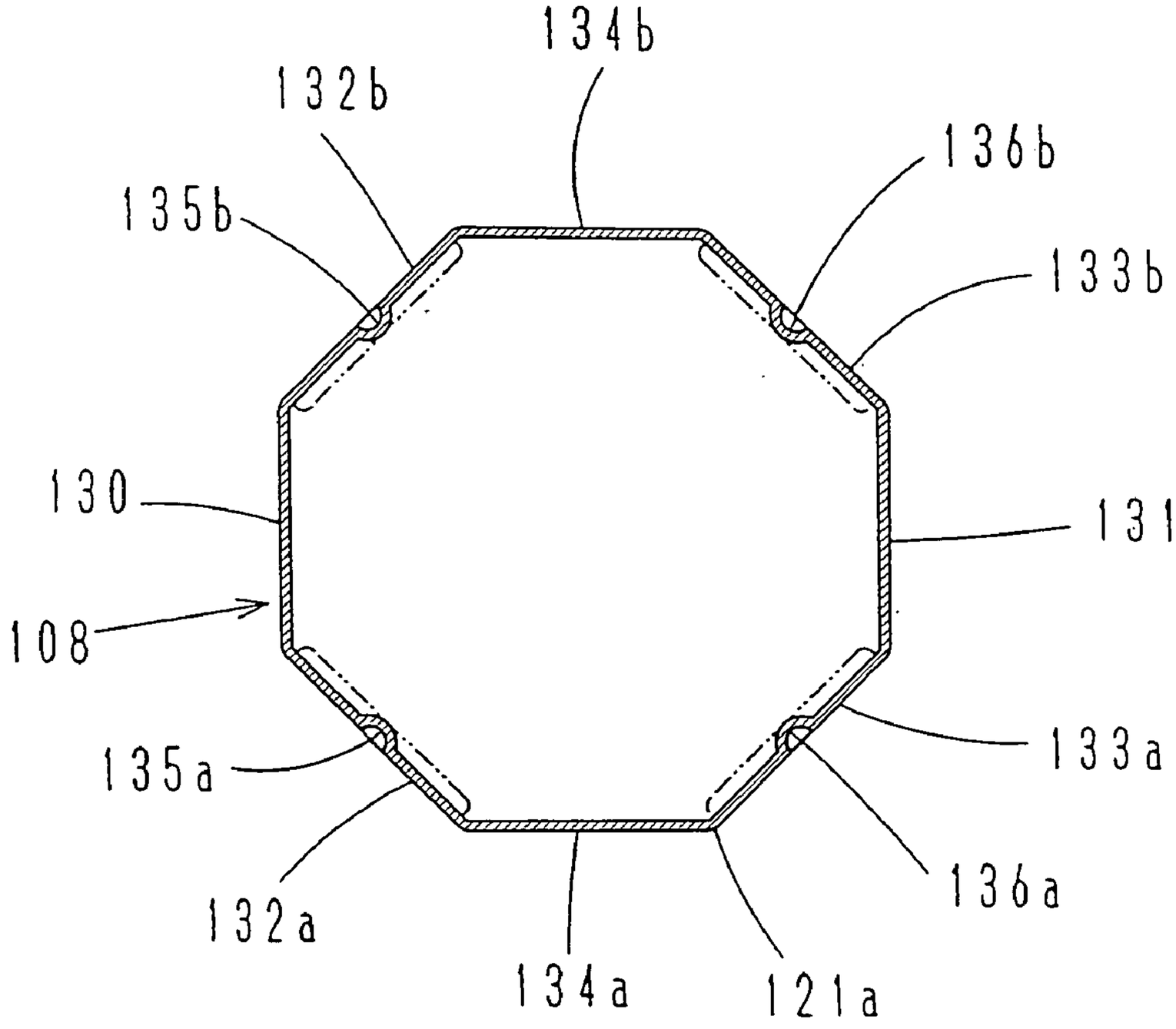
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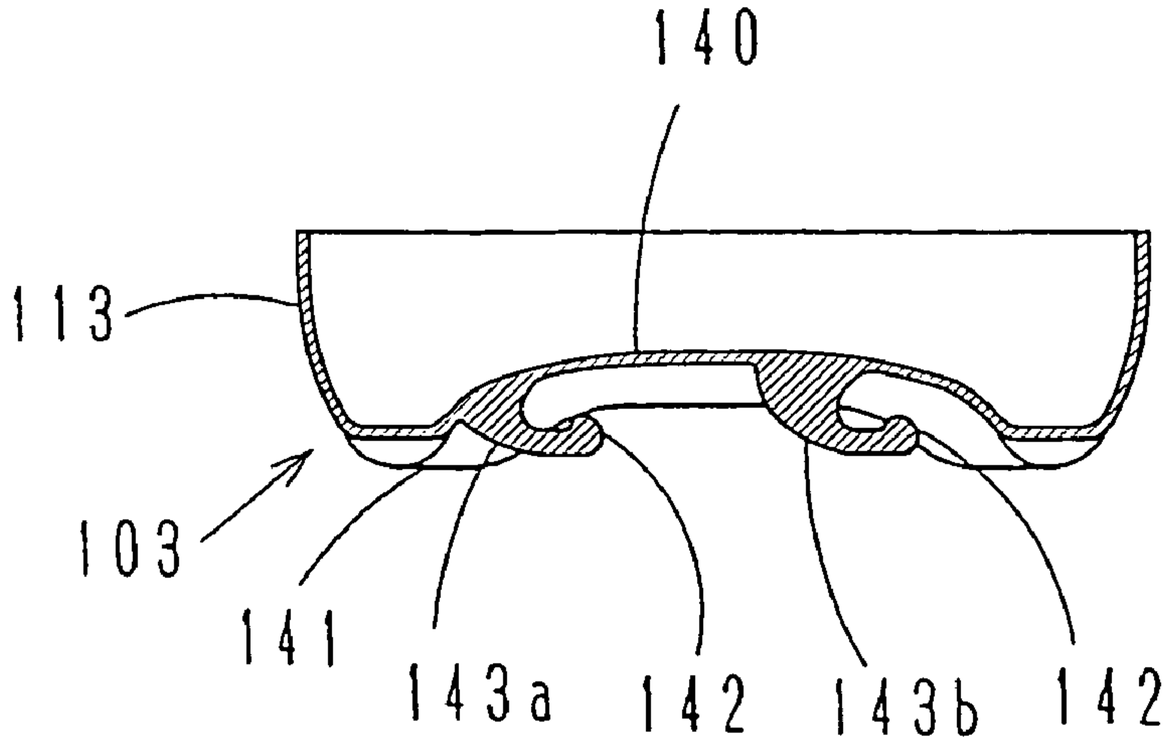
FIG. 32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143a
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143b
142

FIG. 33

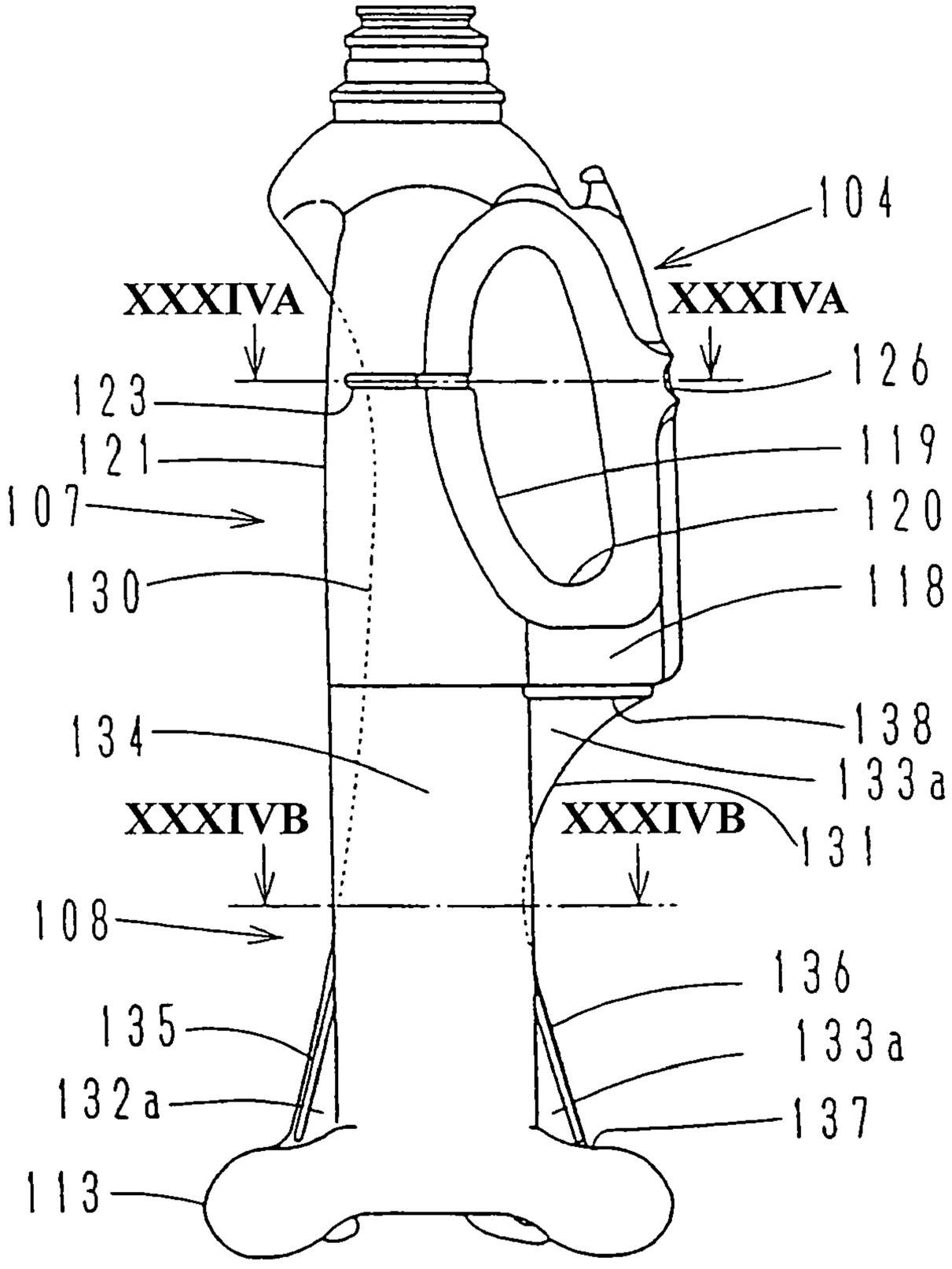
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FIG. 34A

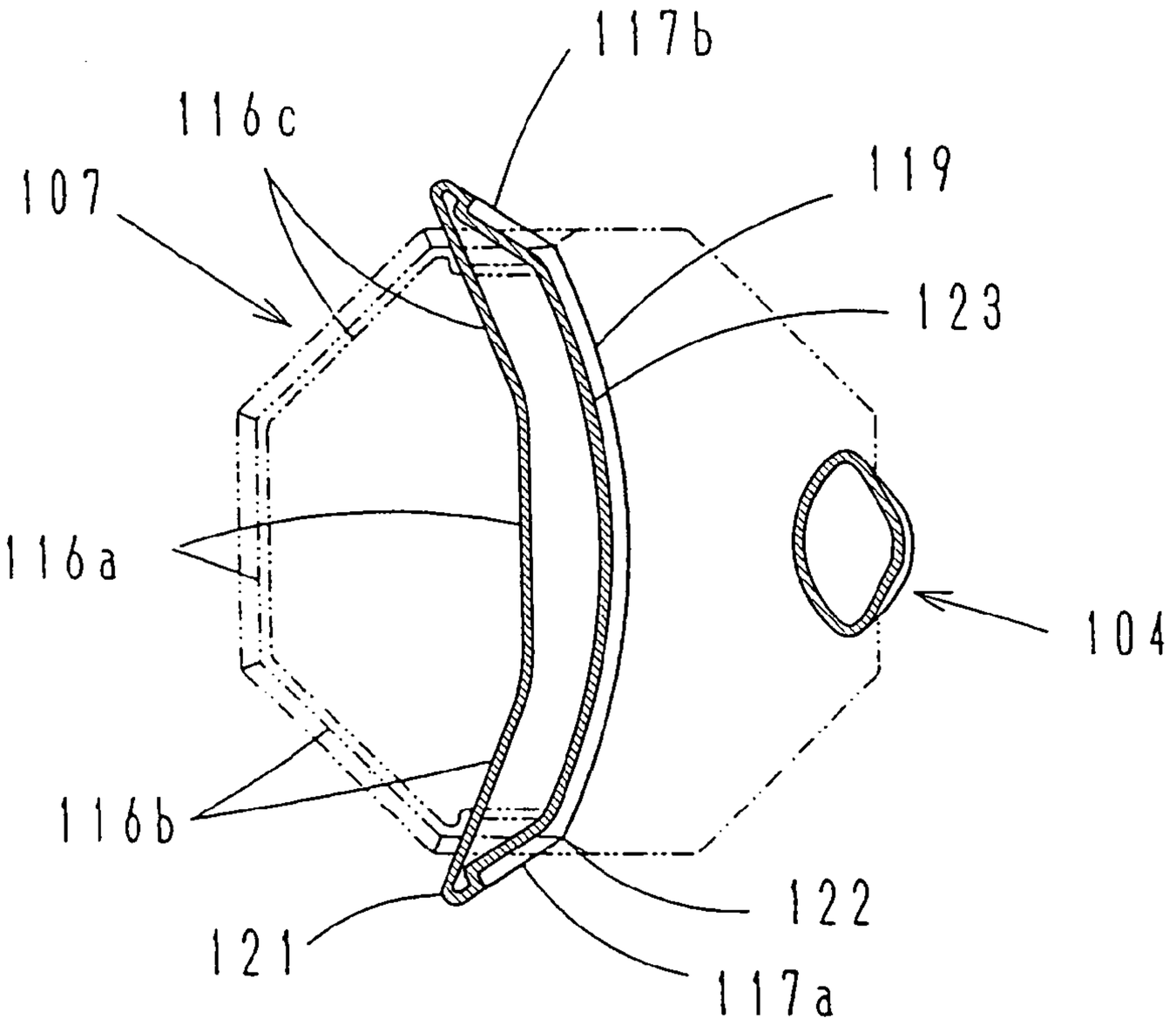

FIG. 34B

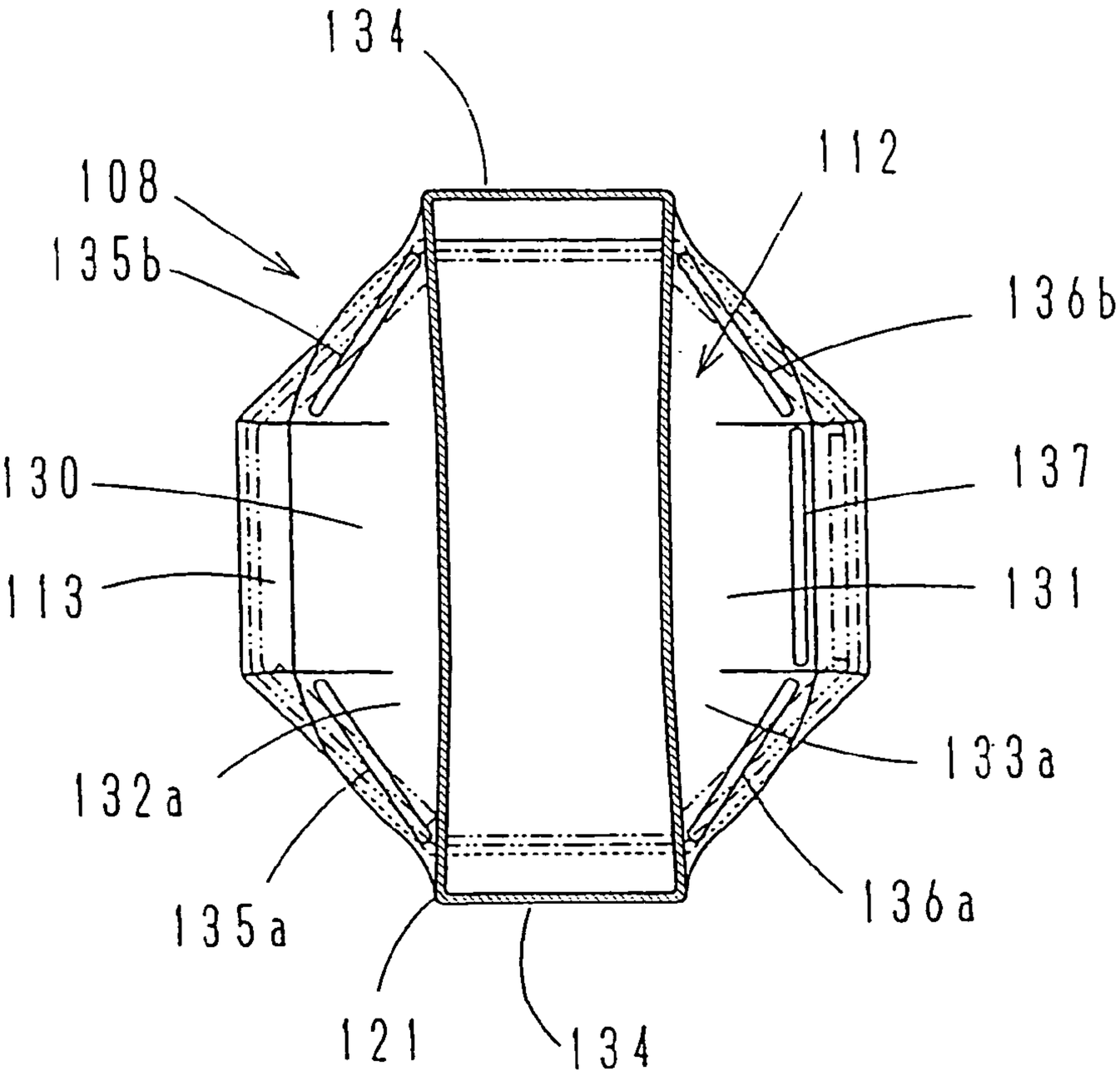

FIG. 35

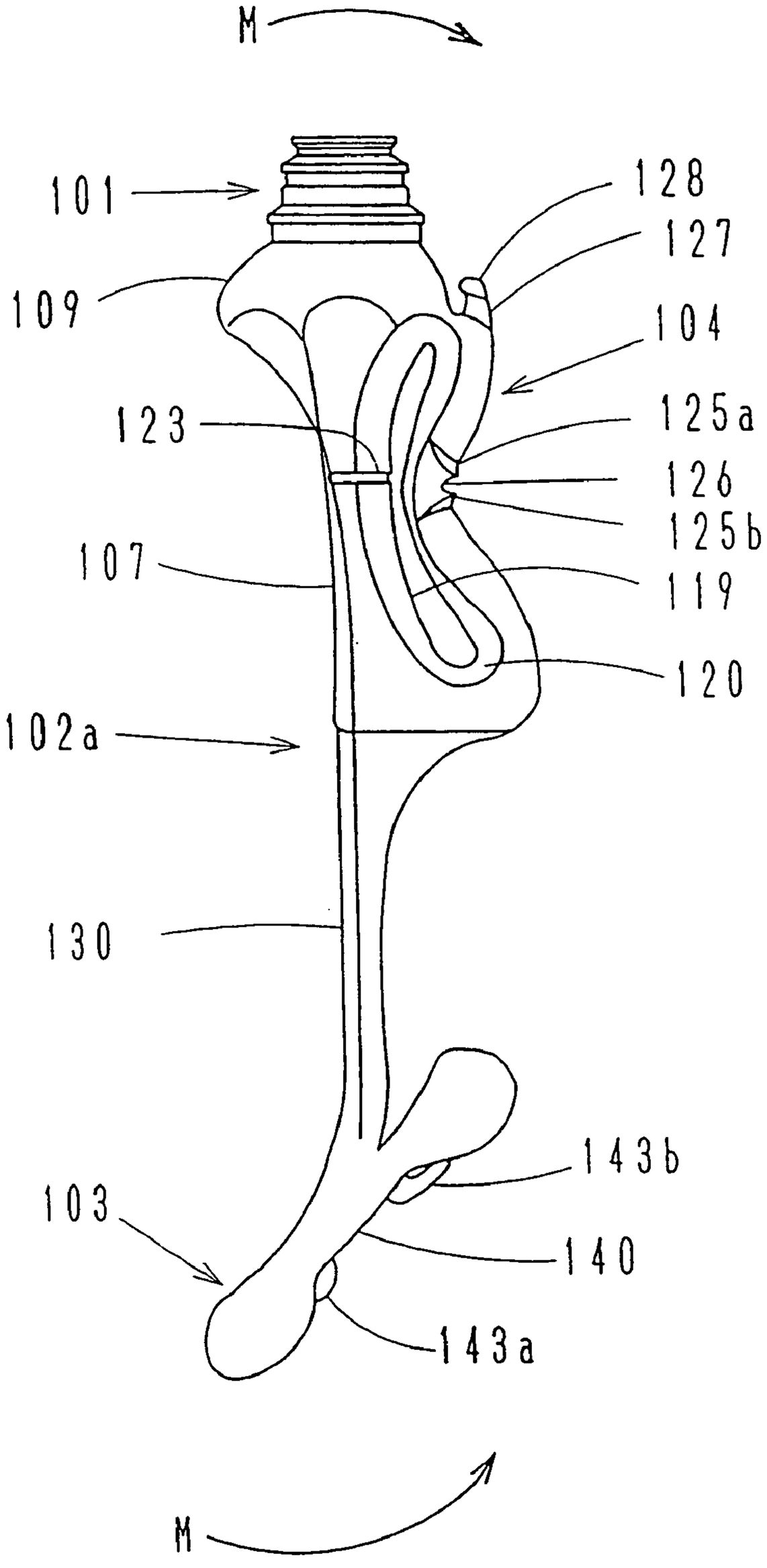
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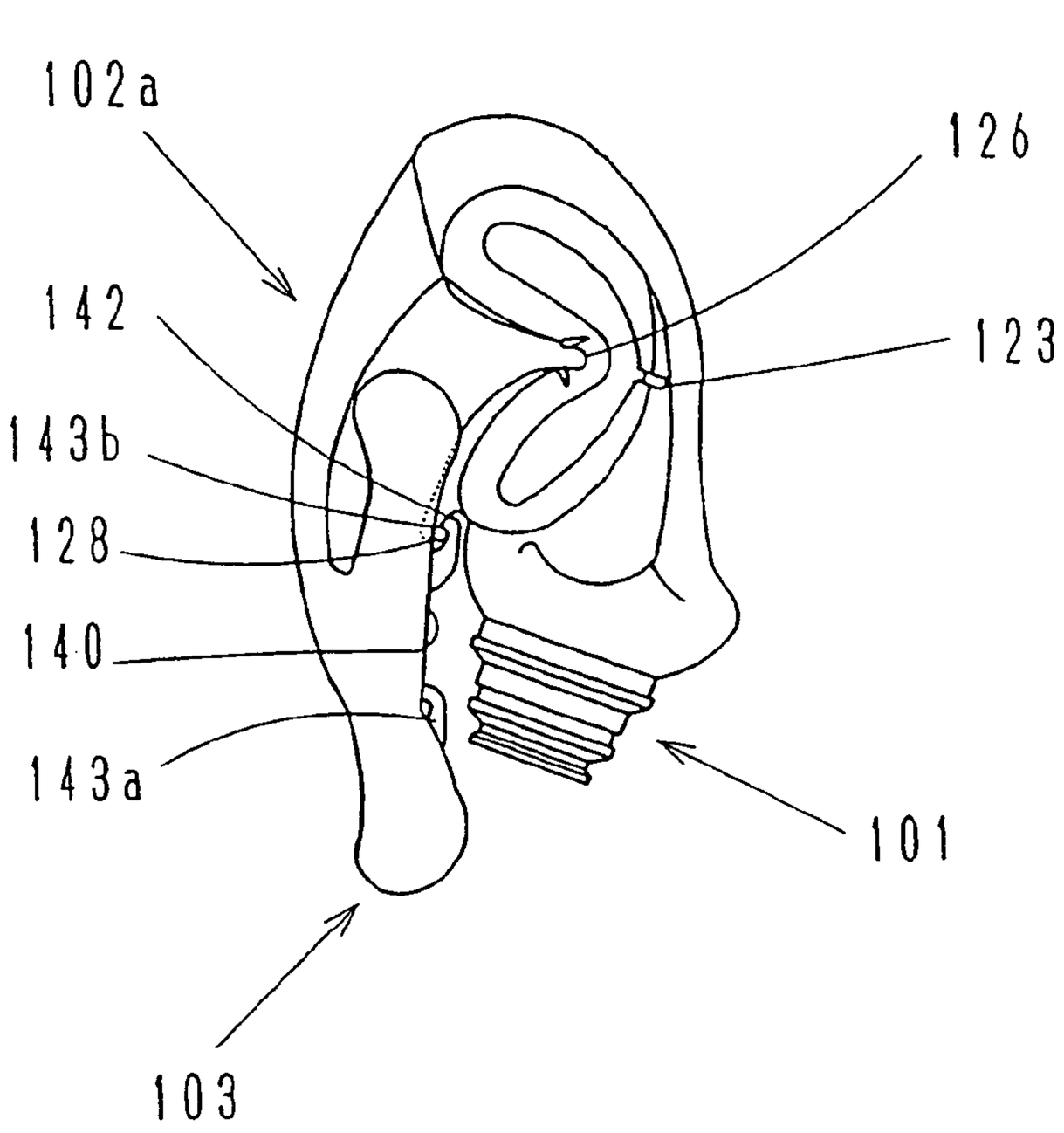
FIG. 36



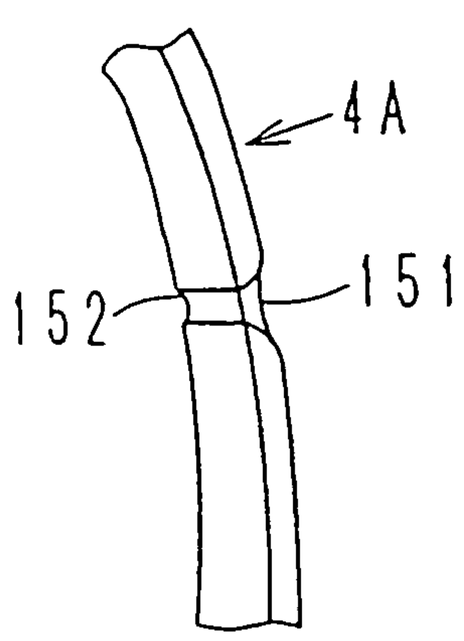


FIG. 37A

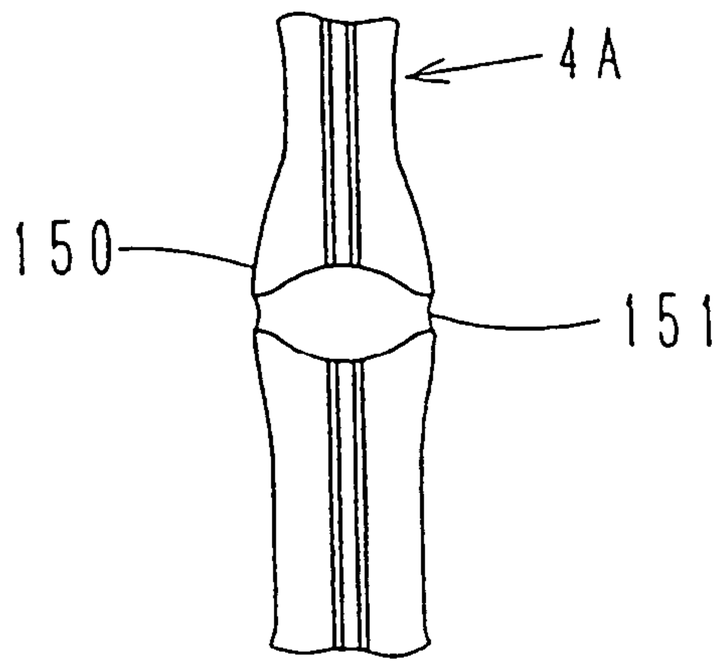


FIG. 37B

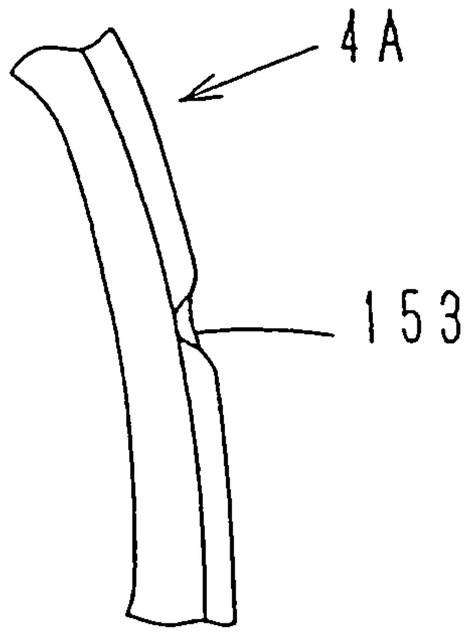


FIG. 38A

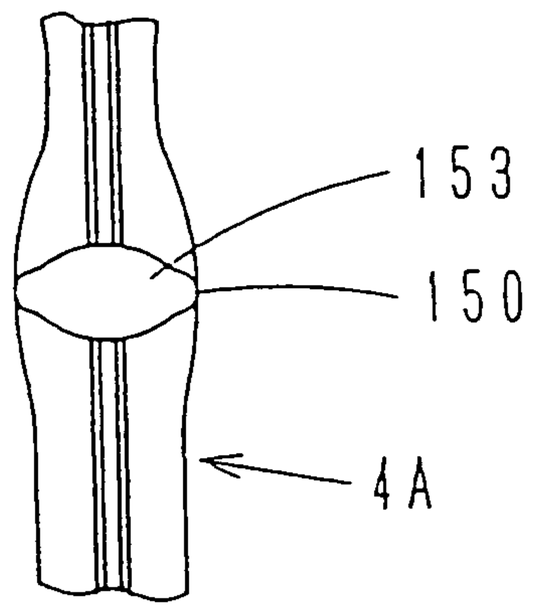


FIG. 38B

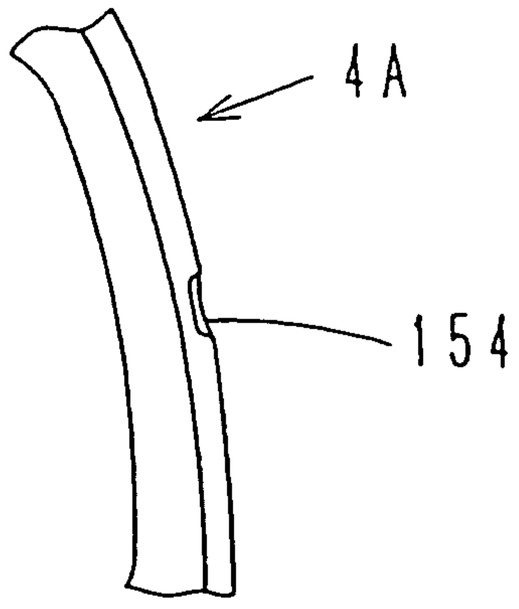


FIG: 39A

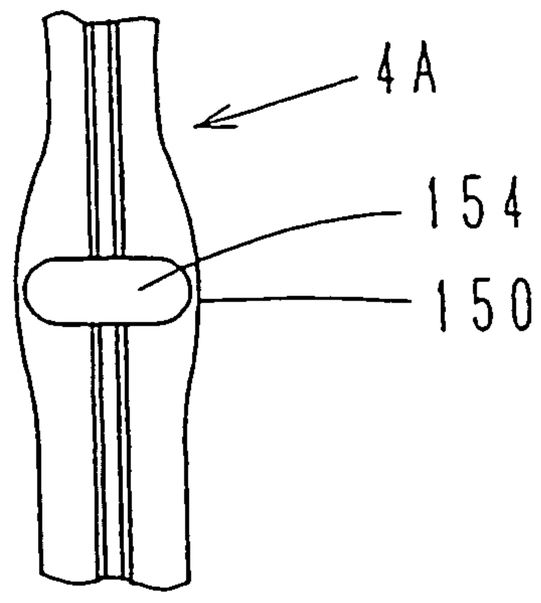


FIG. 39B

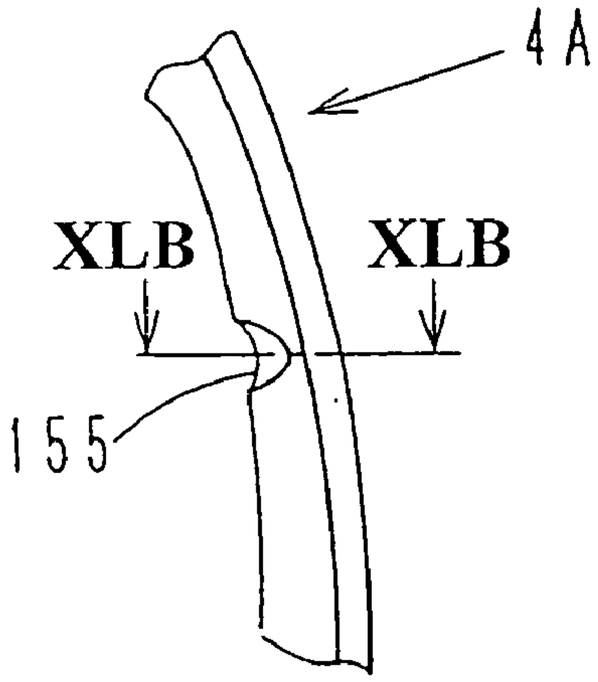


FIG. 40A

FIG. 40B

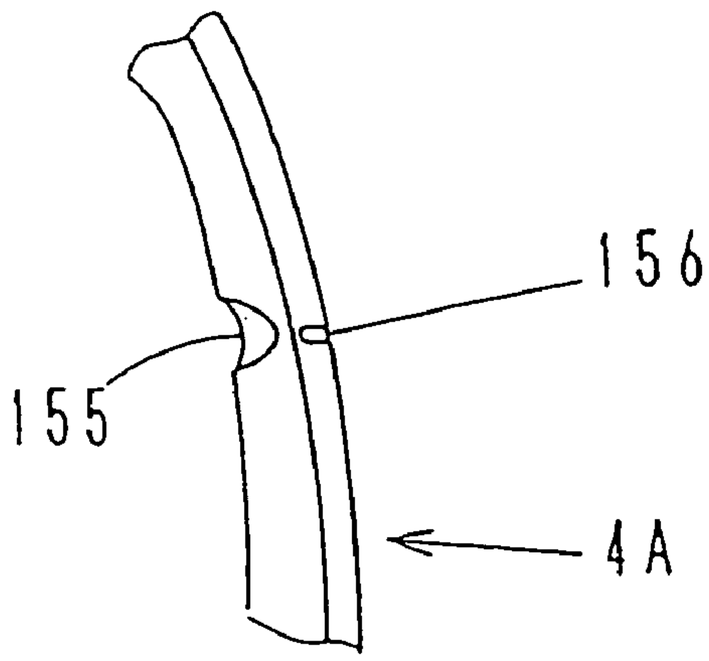


FIG. 41A

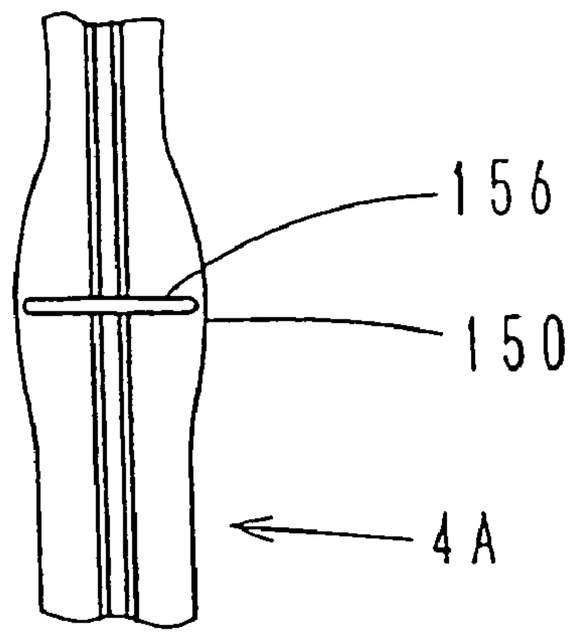


FIG. 41B

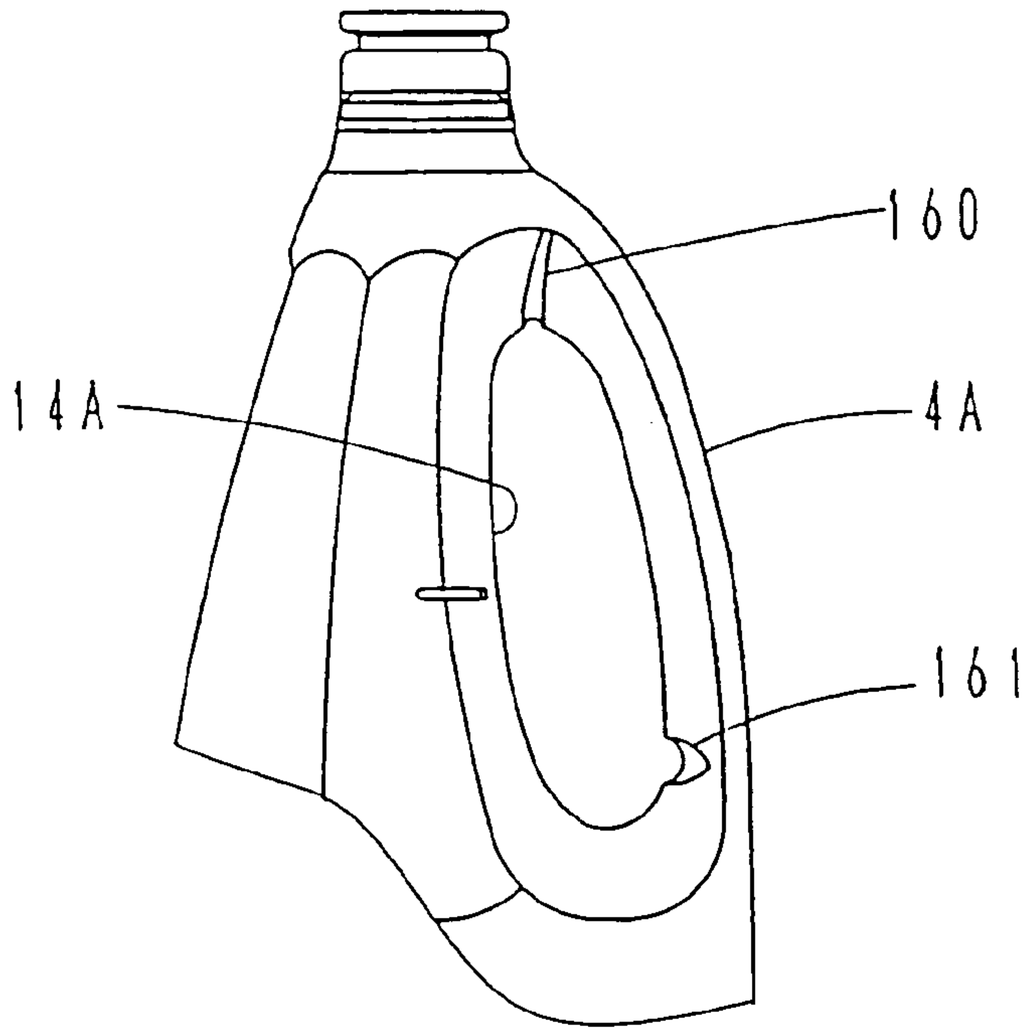


FIG. 42A

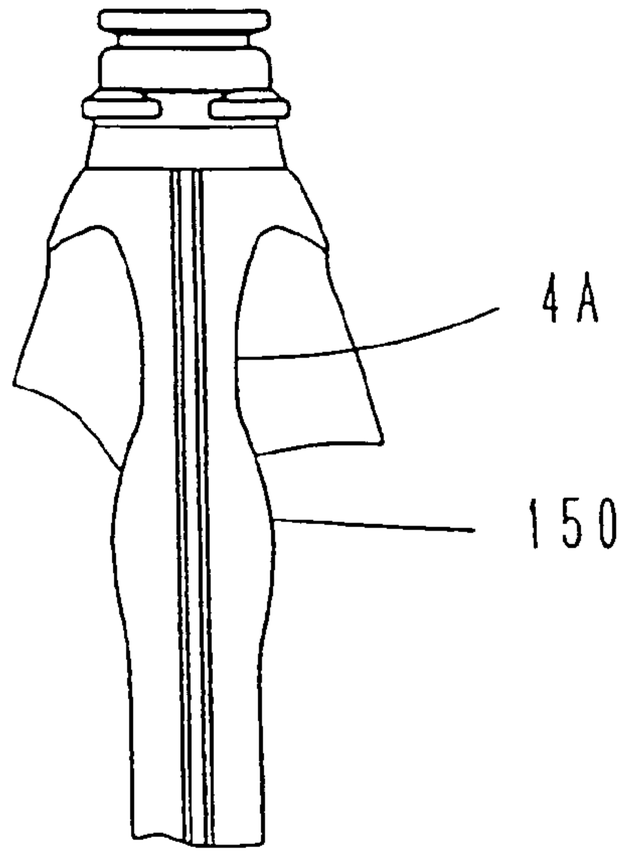


FIG. 42B

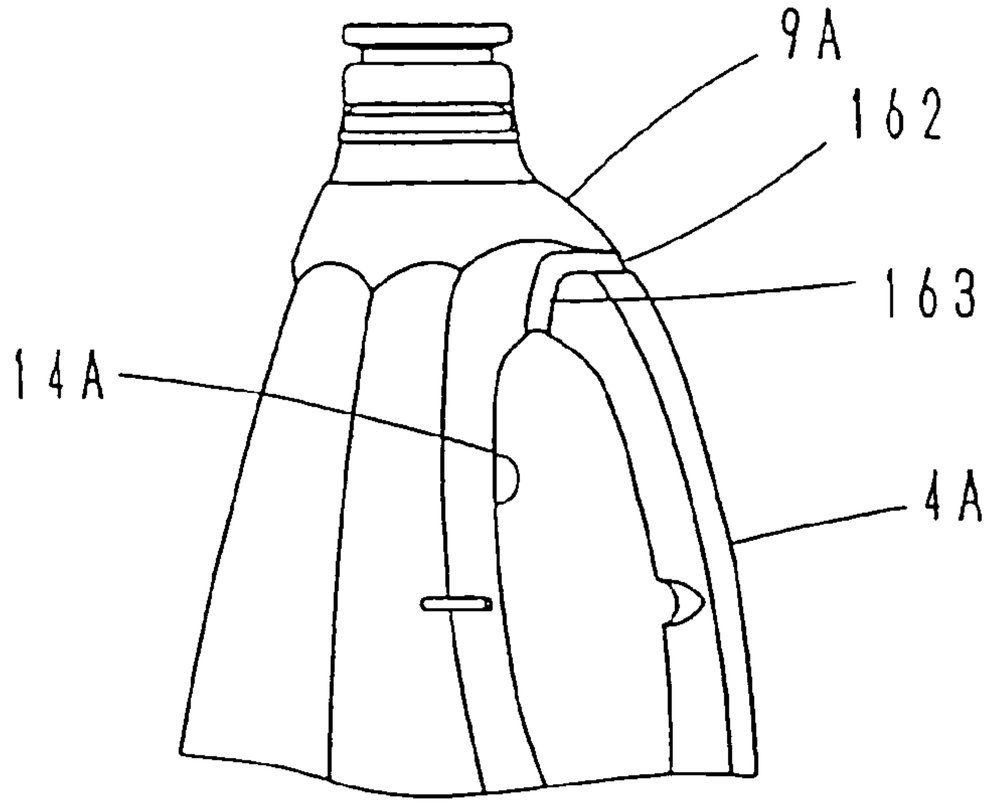


FIG. 43A

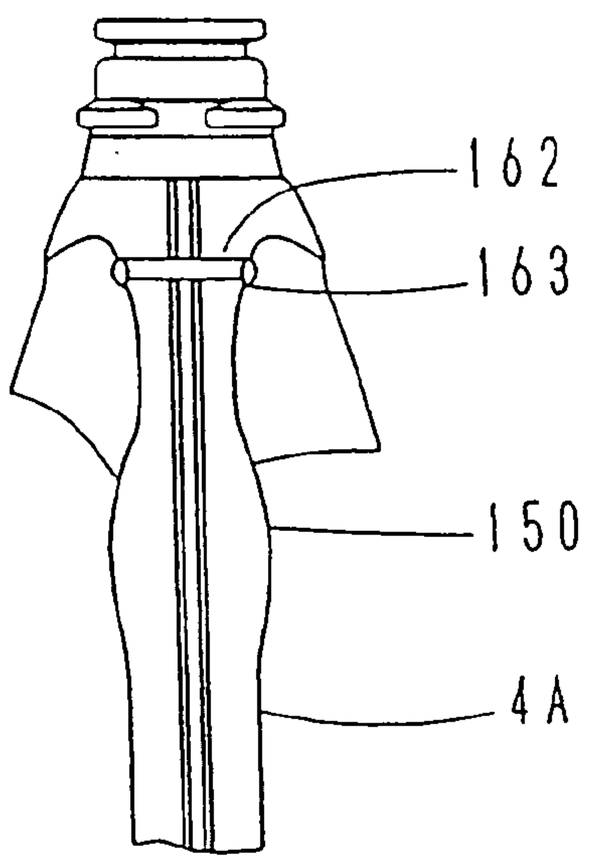


FIG. 43B

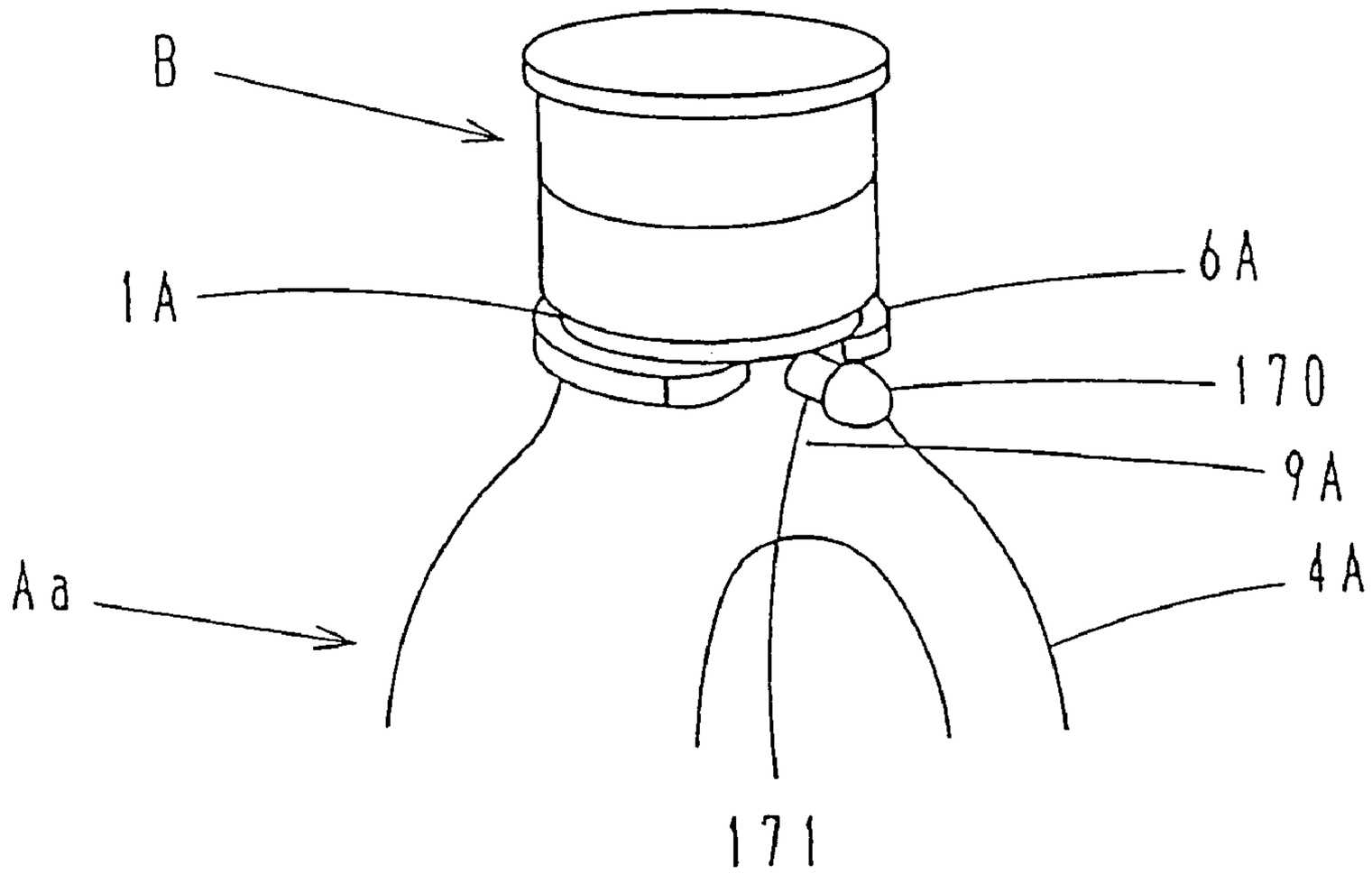


FIG. 44A

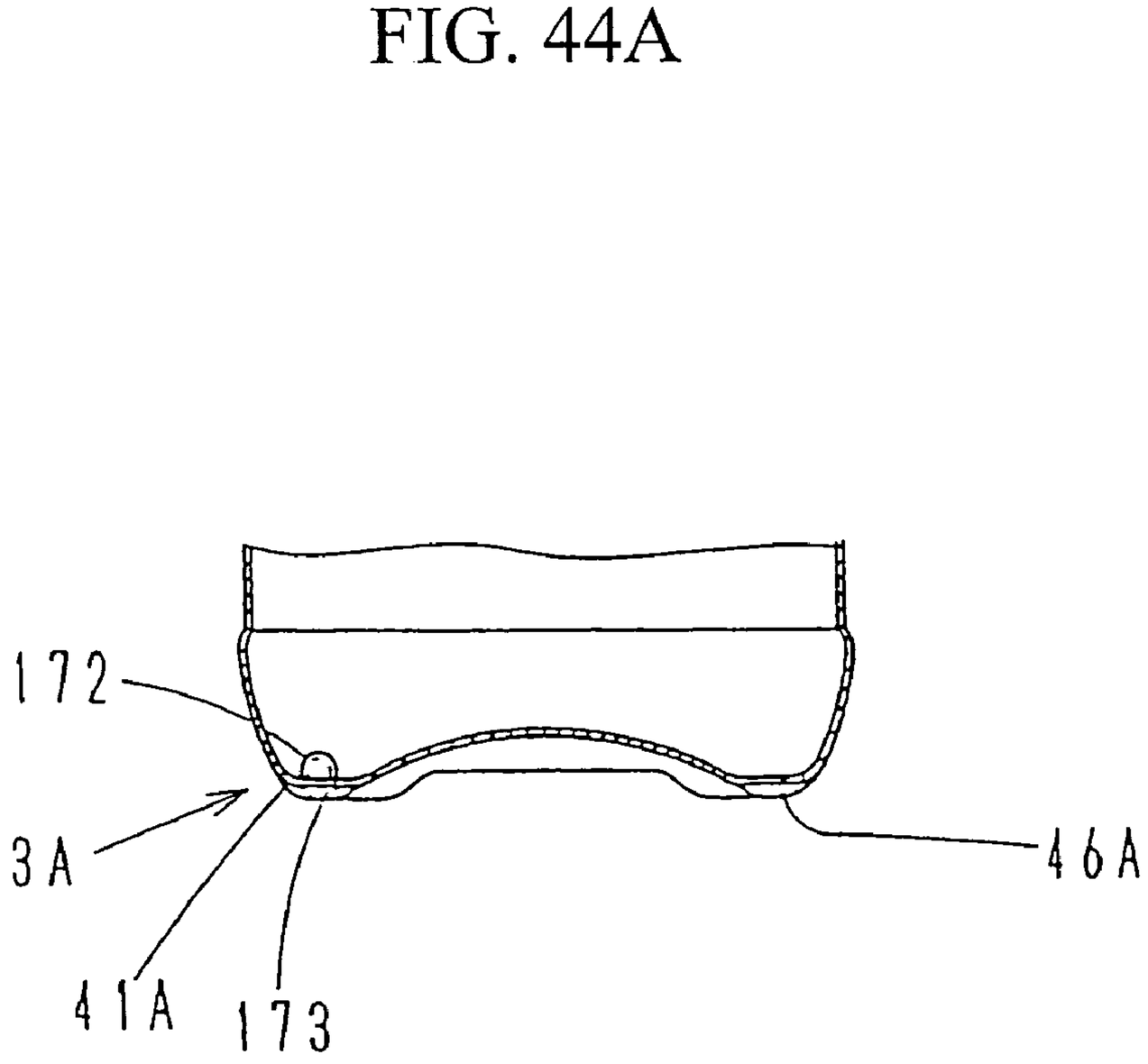


FIG. 44B

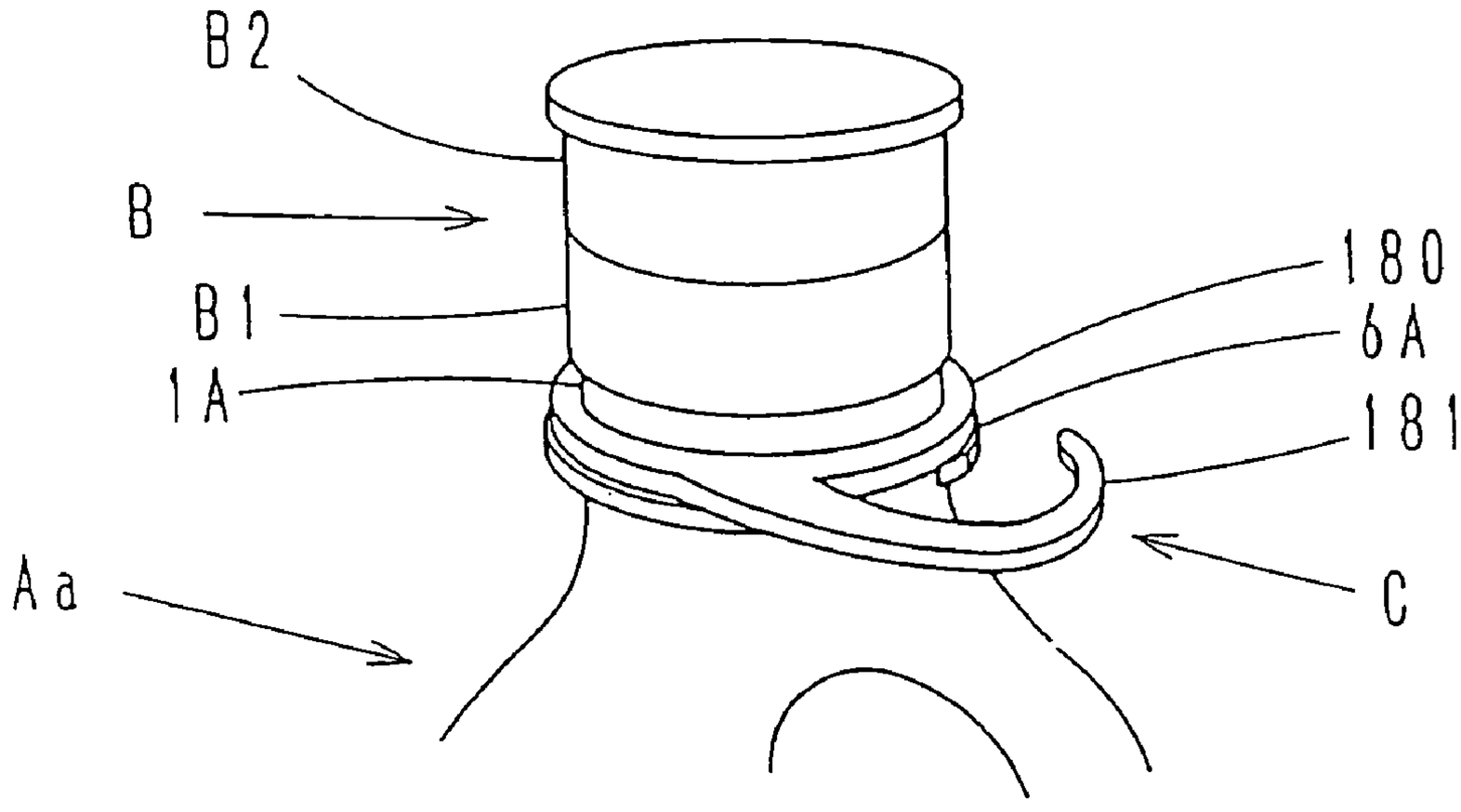


FIG. 45A

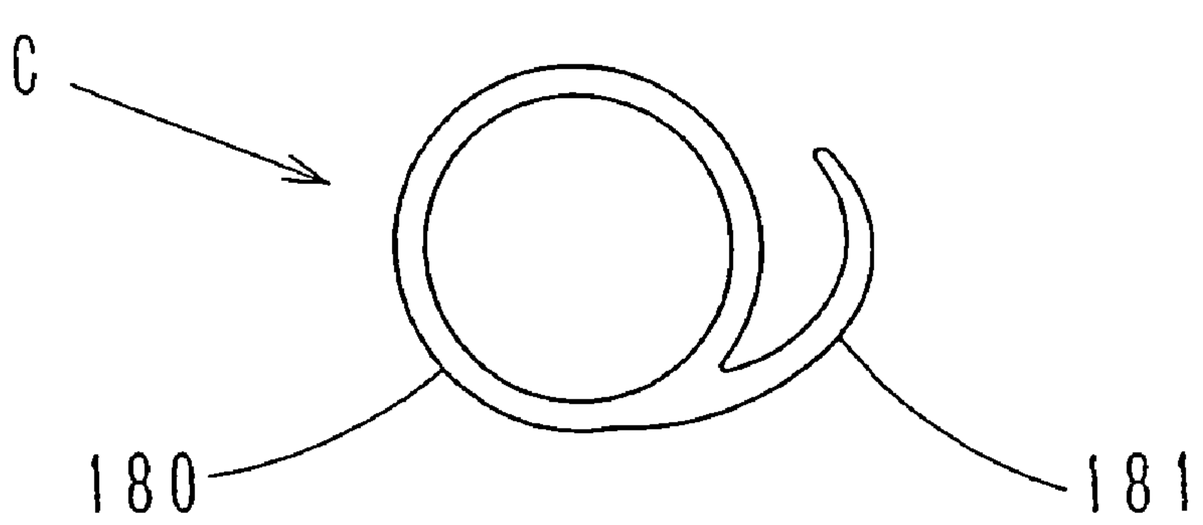


FIG. 45B

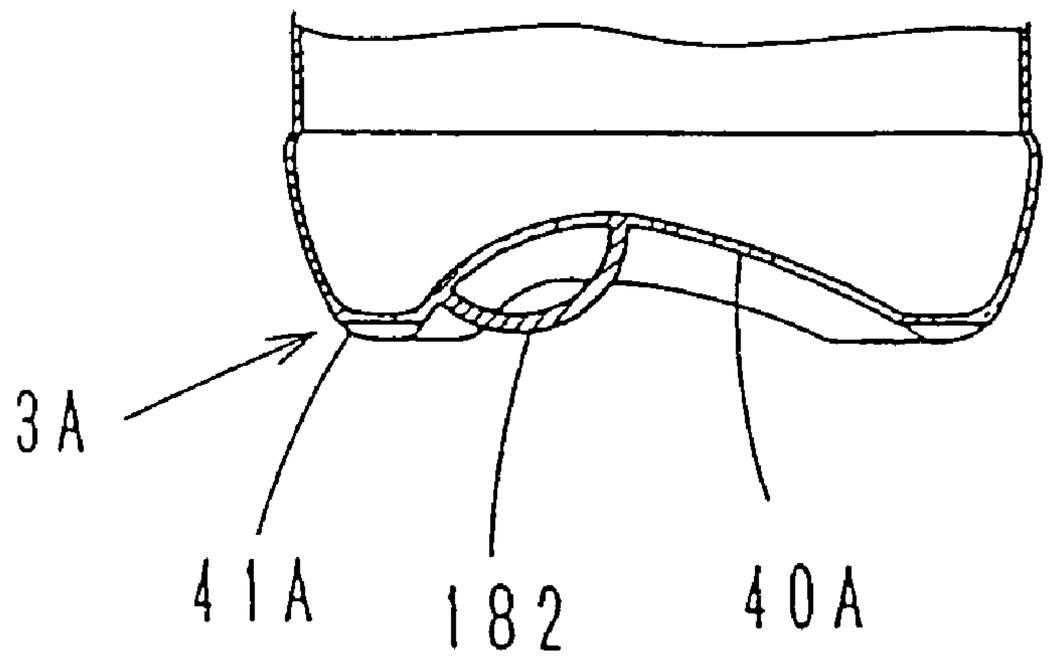


FIG. 46A

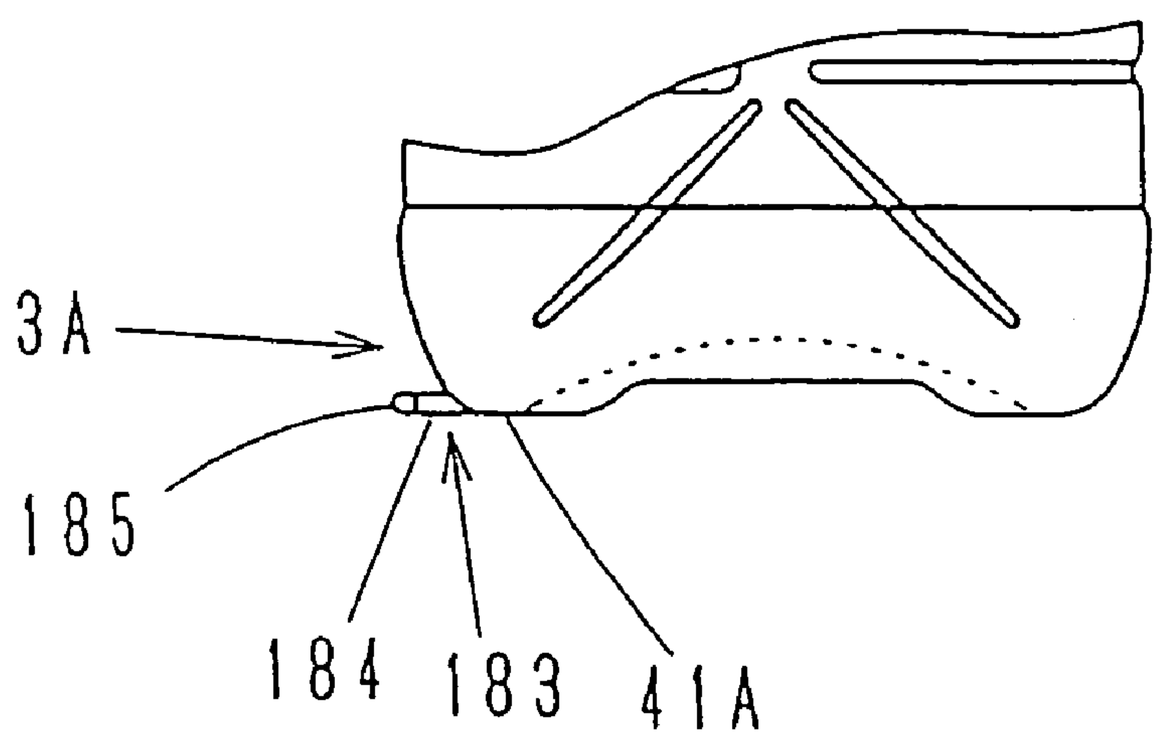


FIG. 46B

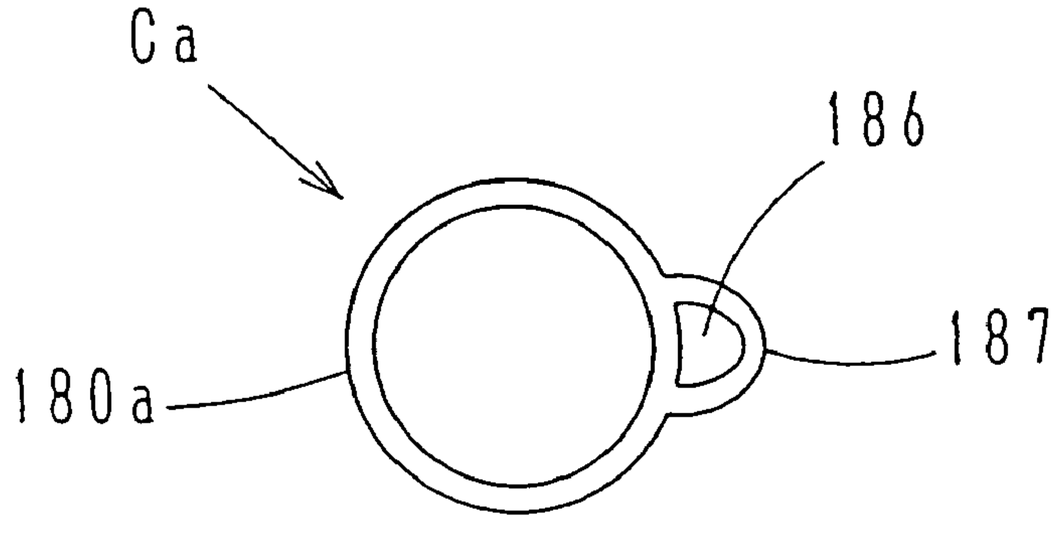


FIG. 47A

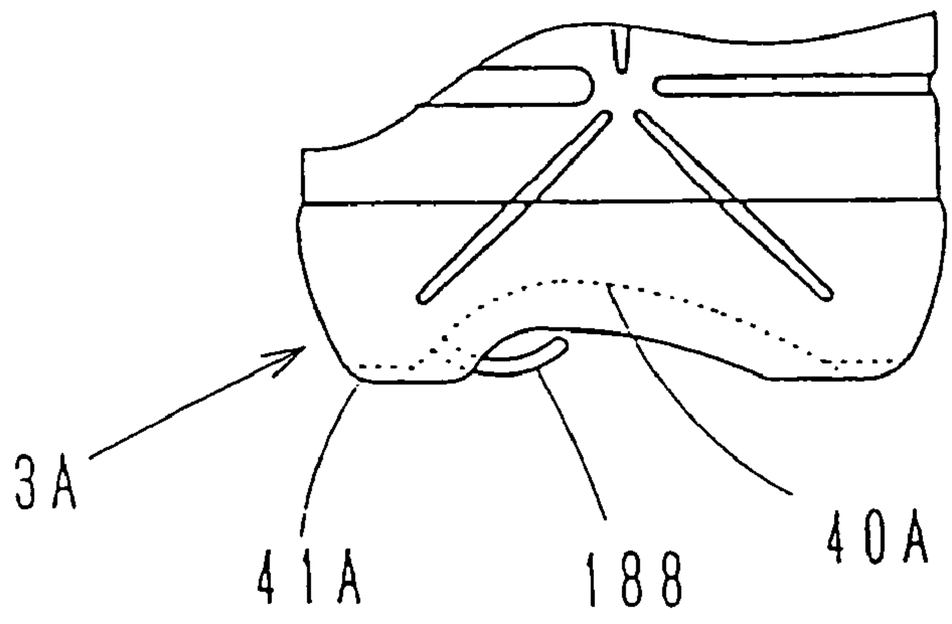


FIG. 47B

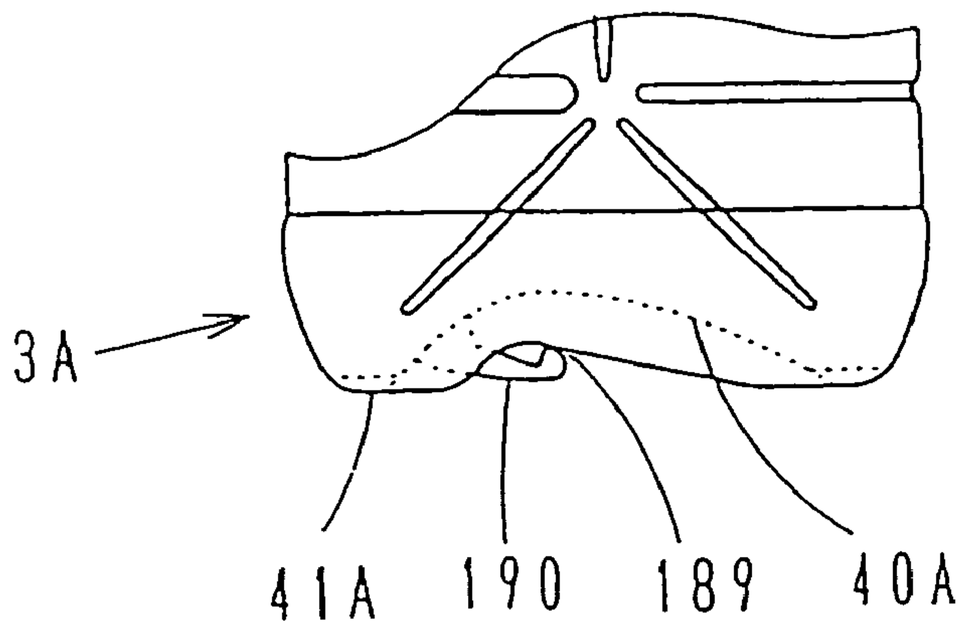


FIG. 47C

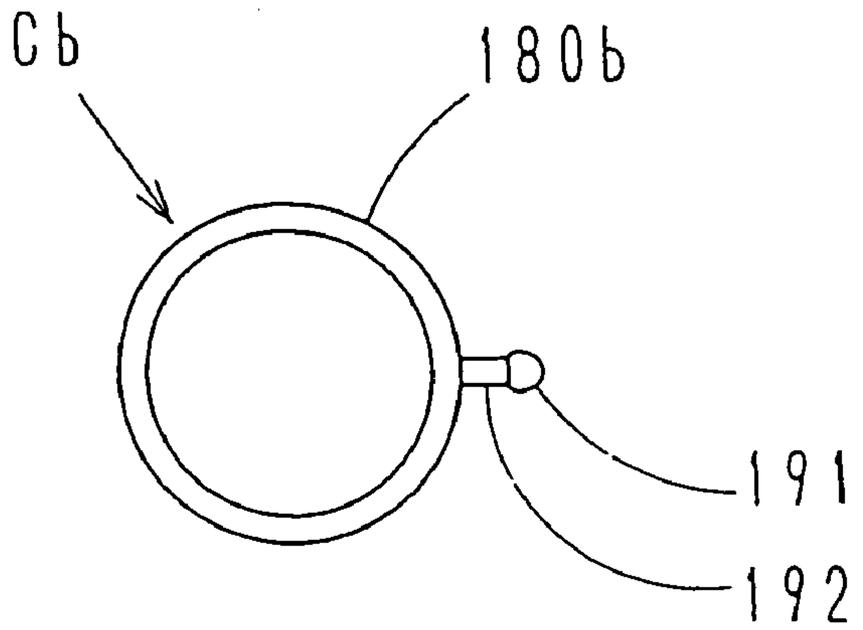


FIG. 48A

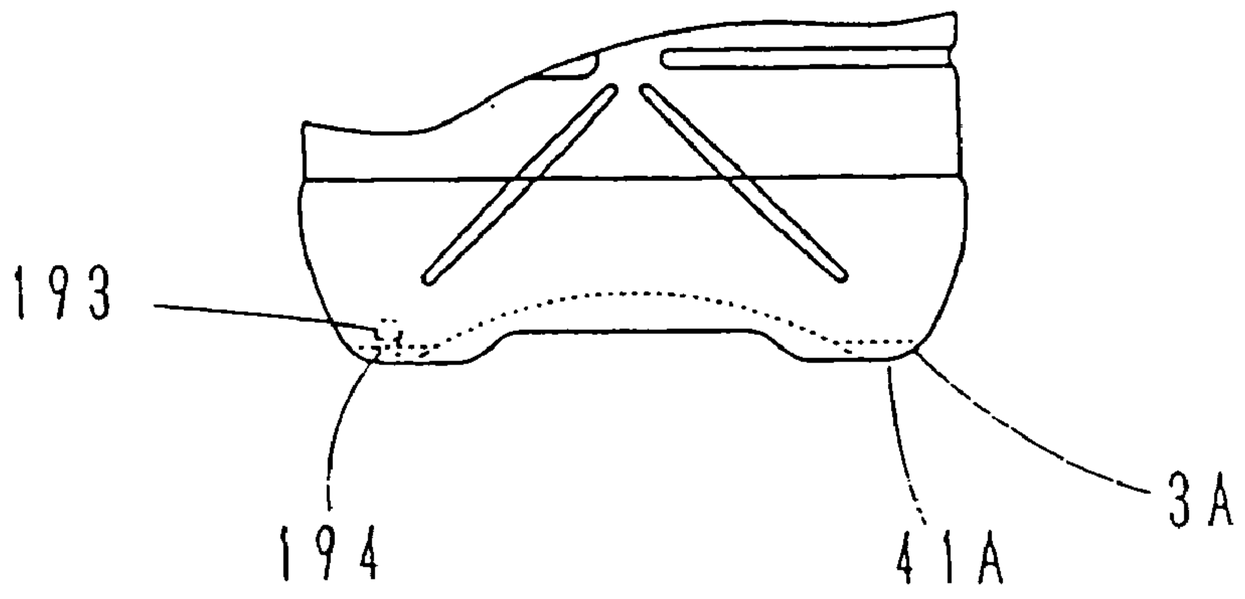


FIG. 48B

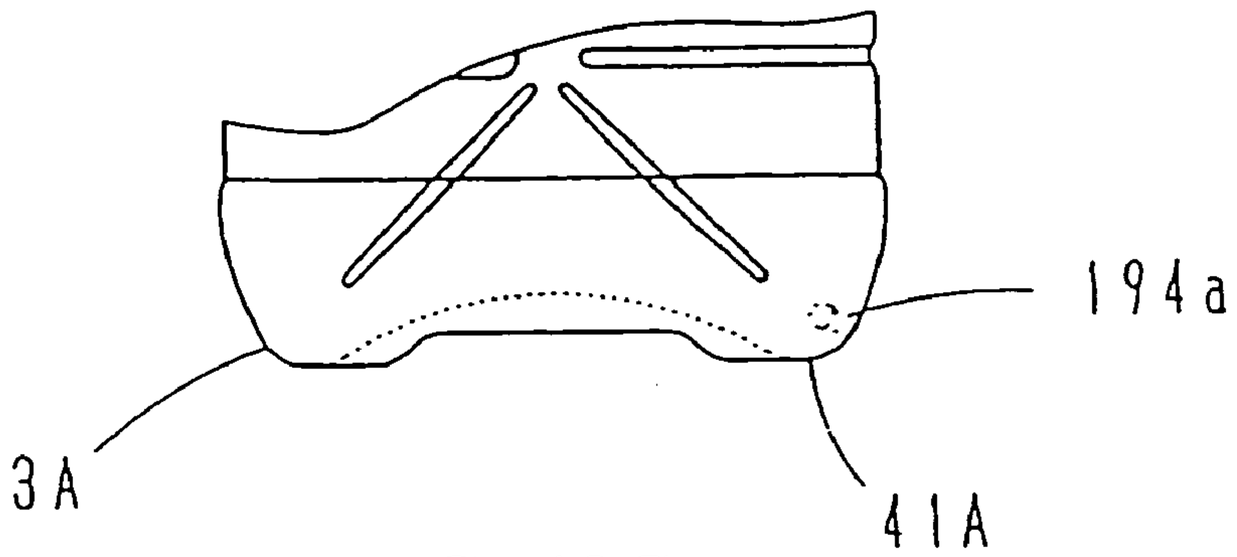


FIG. 48C

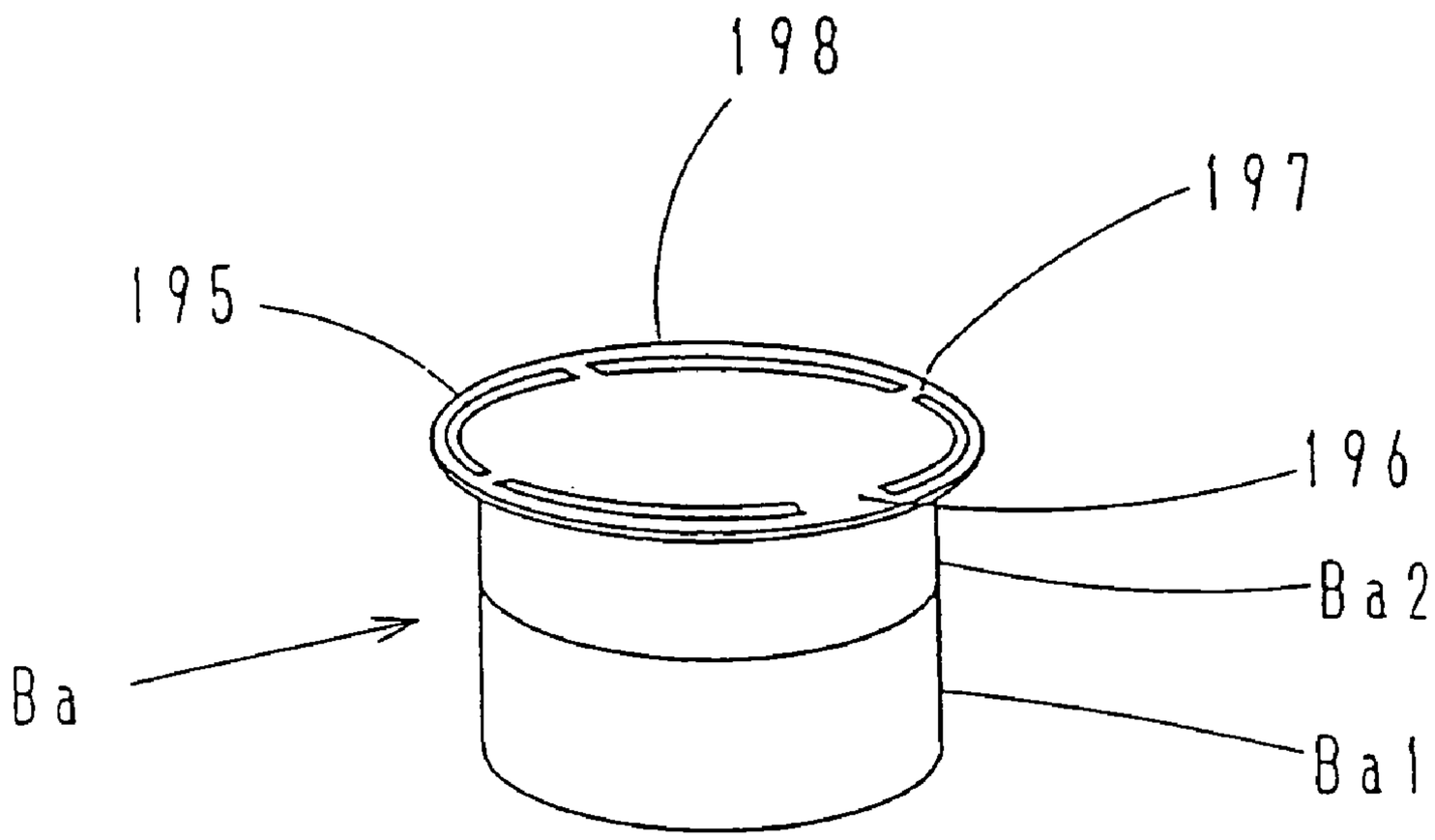


FIG. 49A

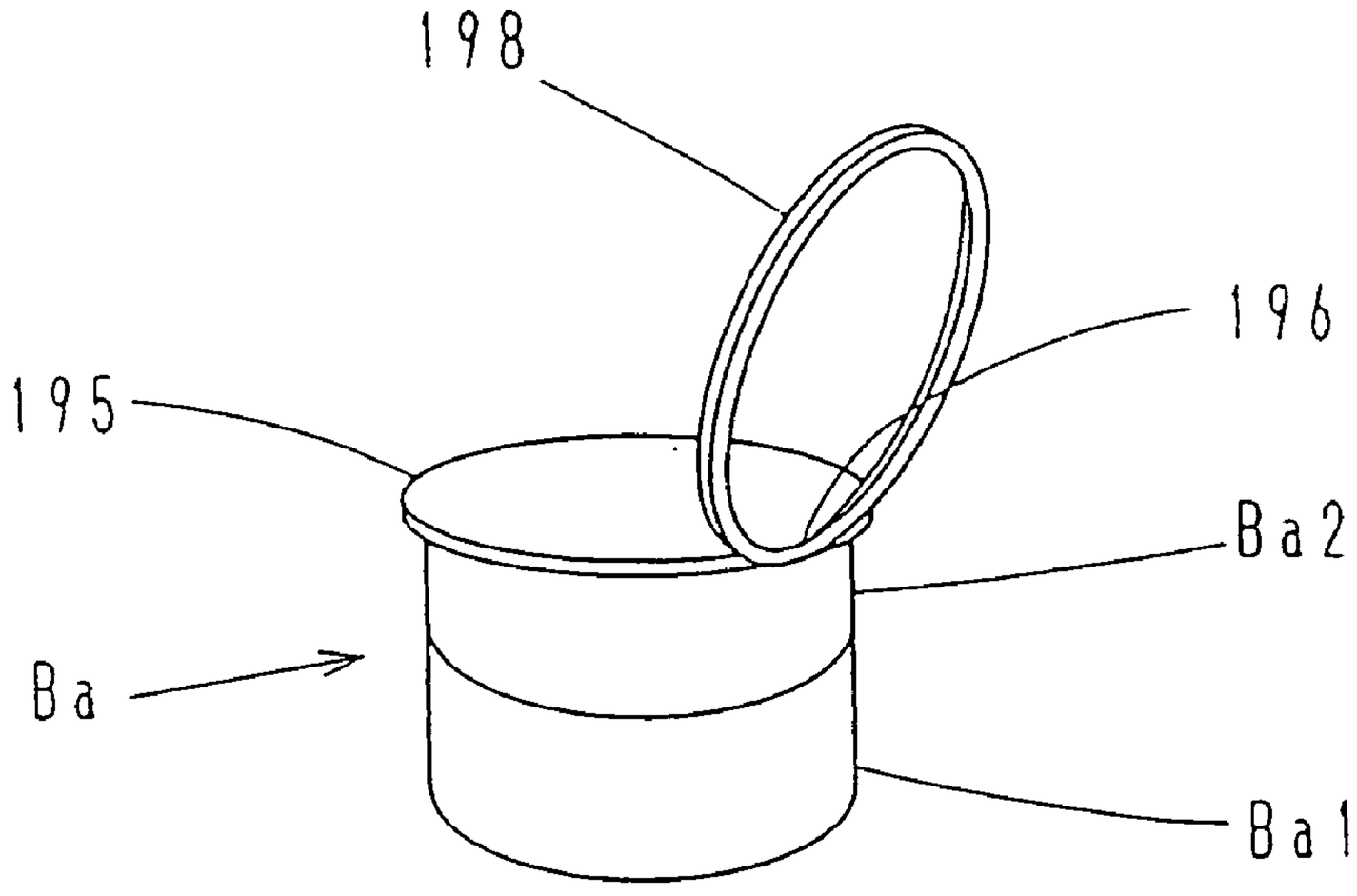


FIG. 49B

FIG. 50

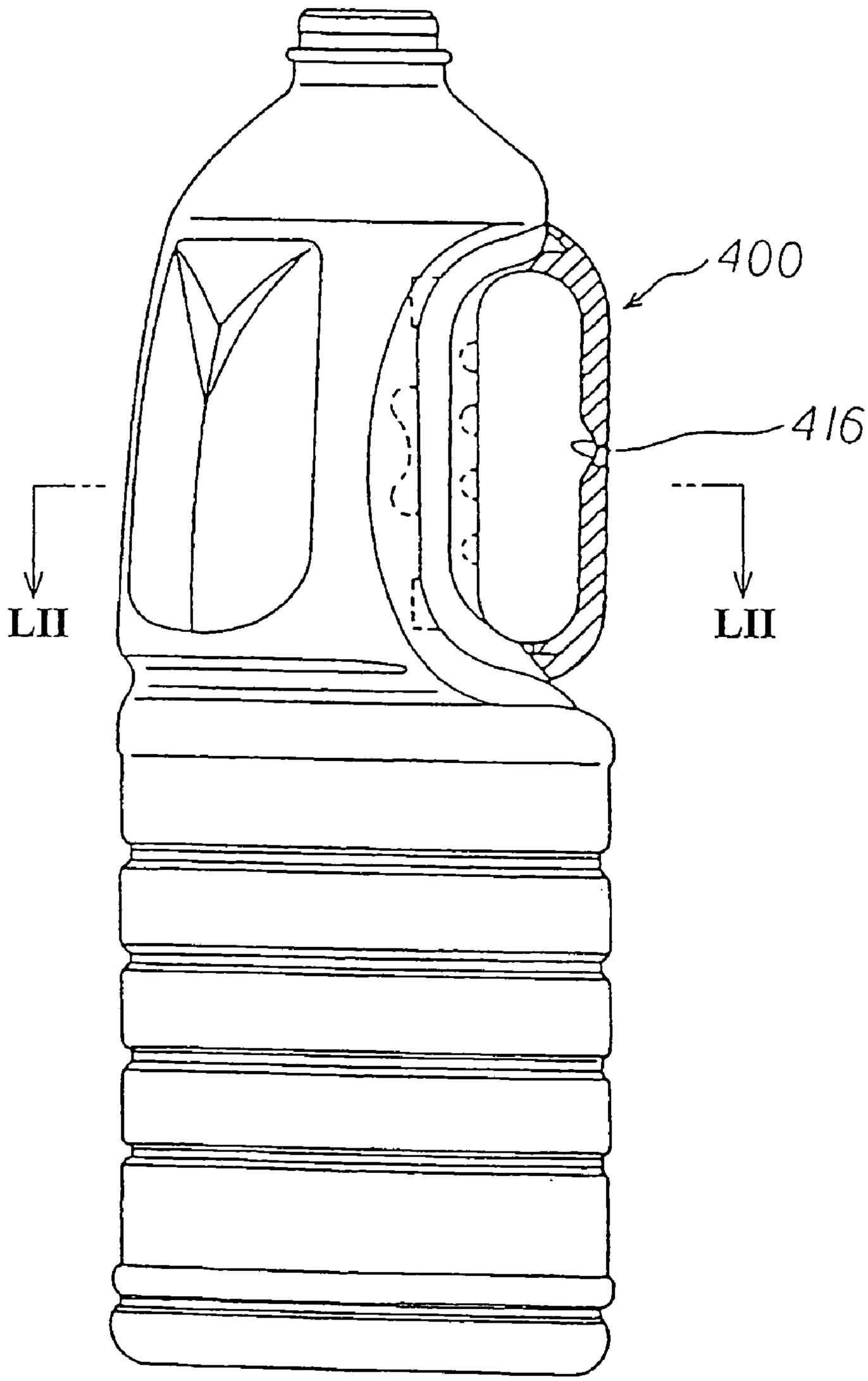


FIG. 51

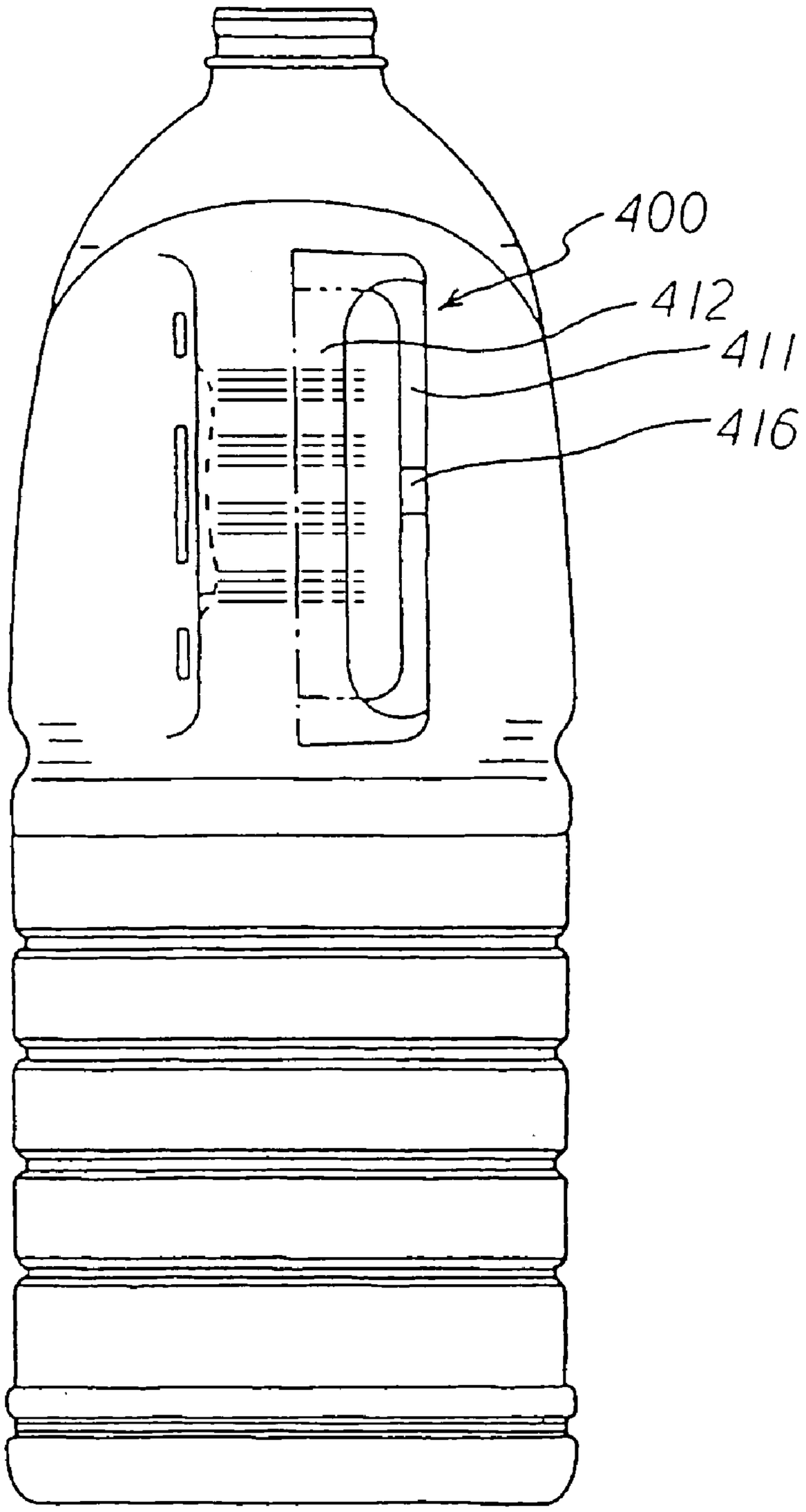


FIG. 52

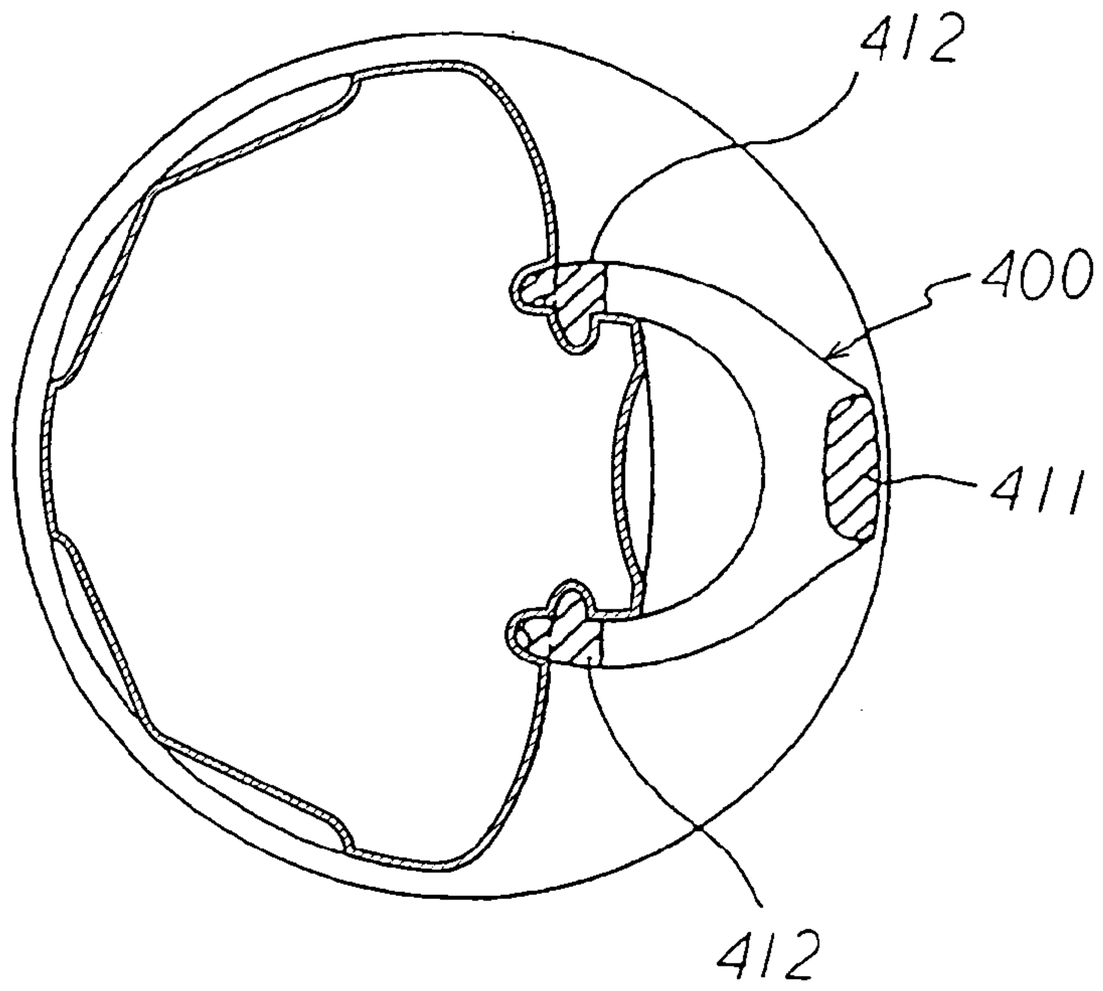
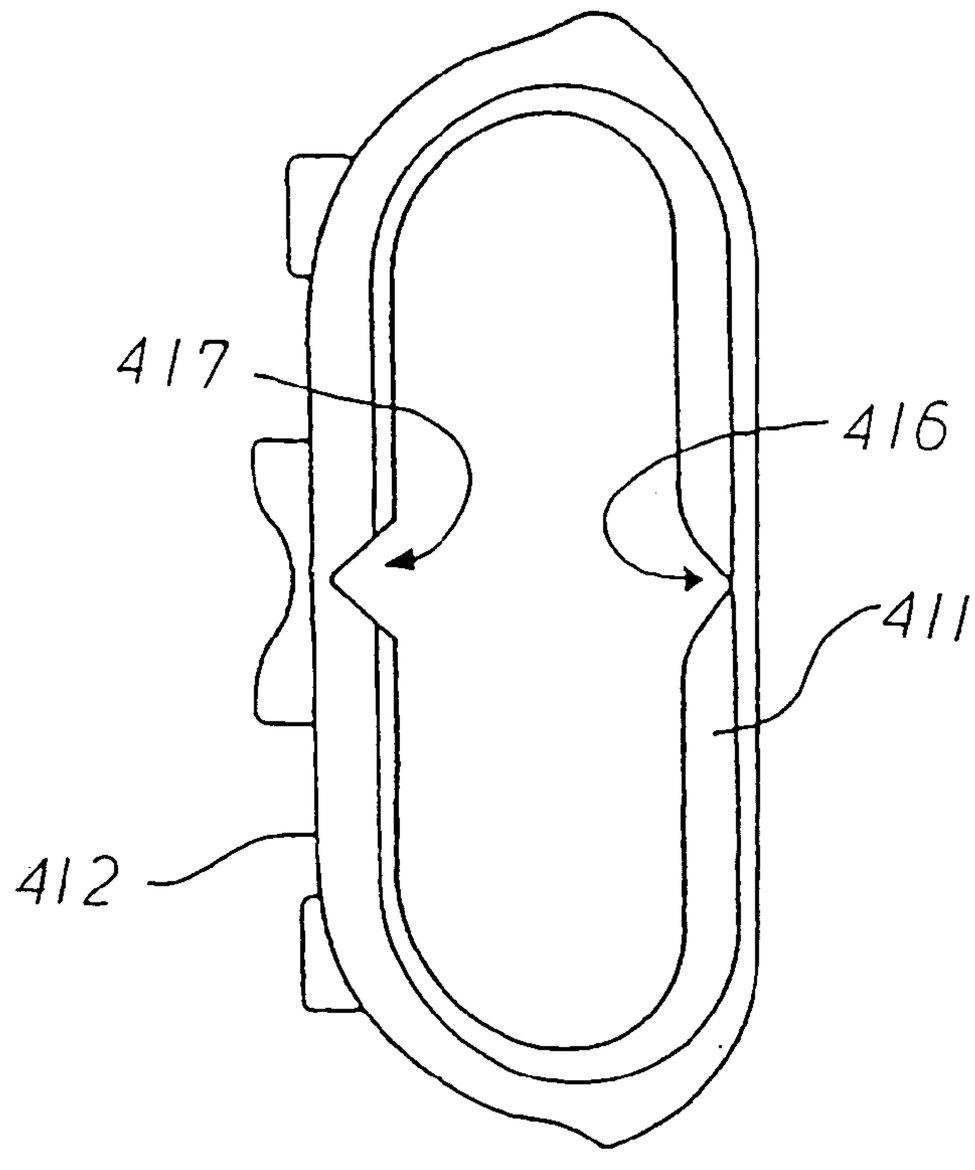


FIG. 53



PLASTIC BOTTLE WITH HANDLE

FIELD OF THE INVENTION

The present invention relates to an easily squeezable plastic bottle with a handle.

BACKGROUND OF THE INVENTION

Recently a disposing of wasted plastic has been a serious problem and a recycle of used plastic containers has been practiced.

Further it has been encouraged and practiced to squeeze containers for disposal to decrease a volume of waste.

Therefore some kinds of easily squeezable plastic containers have been proposed up to now.

However for keeping a certain appearance with containing and protecting liquid contents therein, plastic containers need to have a certain intensity, and a considerable squeezing force has been required for decreasing a volume of used empty plastic containers.

Especially for the plastic bottle with a handle, there has been a problem of a difficulty to squeeze the bottle due to a thick body wall thereof, and the handle portion is difficult to be squeezed.

Further together with the handle, the lower wall surface portion of the bottle body beneath the handle cannot be sufficiently deformed to efficiently decrease a volume of said upper body.

Therefore presently users waste plastic bottles with a handle as it is without squeezing them.

Resultantly the bulk of wasted plastic have been increased and a problem of inefficiency for transporting waste has not been solved.

While if the bottle could be easily squeezed, to prevent the bottle from recovering to the original shape, the internal pressure in the bottle should be kept its depression by putting a cap on the bottle during it being squeezed, therefore it has caused a problem of blending different kinds of materials with waste plastics at the time of recycling operation thereof.

It is an object of the present invention, for solving problems described hereinbefore, to provide various kinds of plastic bottles with a handle for keeping a certain intensity of containing liquid contents, such as at first a flat bottle for disposal which body is flattened by enable of squeezing the handle, the second a flattened and folded bottle into a considerably little capacity and the third a folded waste bottle capable of being wasted without covering a cap if required.

DISCLOSURE OF THE INVENTION

In order to achieve objects of the present invention, this invention is constituted as follows.

The bending deformation portion is formed in the handle of the plastic bottle to squeeze the handle and to efficiently decrease a volume of the upper body portion.

Preferably the bending deformation portion is formed in the middle portion of the longitudinal direction of the handle. The bending portion is formed in the middle bulging portion in the center of the longitudinal direction of the handle, and comprises of the concave portion, the concave rib and the like formed in the outer circumference and/or the inner circumference of the middle bulged portion.

More preferably the bending rib is arranged between the upper end and the body wall surface.

To obtain the flat bottle for disposal which the body portion is flattened, the bending rib may be formed in the body of the plastic bottle for the squeezable and deformable body wall.

The body of the plastic bottle comprises the upper body including the handle, the lower body and the bottom. The upper body comprises the curved wall on the side surface for attaching the handle and the side wall. The bending rib extending laterally may be formed in the curved wall and the side wall adjacent to the curved wall, thereby the upper body of the bottle can be further squeezed by bending the handle.

To obtain the further folded bottle for disposal that the volume is efficiently decrease, further one or more hanging pieces may be projected from the bottom and the engaging piece having the hook may be erected from the upper end portion of the handle.

Furthermore to waste the bottle separately from the cap, the hanging piece having the hook may be projected from the left side of the bottom wall surface of the bottom to engage the hanging piece with the neck in preventing from covering the cap, and the bottle can be necessarily distinguished for recycling the waste things.

For achieving an easily squeezing, the indication showing sequence numbers of squeezing and/or the operation contents of squeezing according to the operation procedures of squeezing may be formed in the predetermined place.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front view of a plastic bottle according to the first embodiment of the present invention;

FIG. **2** is a right side view of the bottle shown in FIG. **1**;

FIG. **3** is a plane view of the bottle shown in FIG. **1**;

FIG. **4** is a bottom view of the bottle shown in FIG. **1**;

FIG. **5** is a cross sectional view along line A-A of FIG. **1**;

FIG. **6** is an enlarged cross section view of the a bending rib;

FIG. **7** is a vertical cross section view of the bottom of the bottle;

FIG. **8** is a front view in a state of the handle being bent;

FIG. **9** is a front view of the bottle which an upper body is pressed;

FIG. **10** is a front view of the bottle which a lower body is pressed;

FIG. **11** is a front view of the flattened bottle;

FIG. **12** is a right side view of the flattened bottle;

FIG. **13** is a front view in a state of a flat body of the bottle being bent;

FIG. **14** is a front view of the bottle to be bent;

FIG. **15** is a front view of the bottle according to the second embodiment of the invention;

FIG. **16** is a right side view of the bottle shown in FIG. **15**;

FIG. **17** is a plane view of the bottle shown in FIG. **15**;

FIG. **18** is a bottom view of the bottle shown in FIG. **15**;

FIG. **19** is a cross sectional view along line A-A of FIG. **15**;

FIG. **20** is a cross sectional view along line B-B of FIG. **15**;

FIG. **21** is a longitudinal sectional view of the bottle bottom;

FIG. **22** is a front view of the reversely deformed bottle;

FIG. **23** is a cross section view of the reversely deformed bottle, in which (a) is a cross sectional view thereof along line A-A of FIG. **22**, and (b) is a cross sectional view thereof along line B-B of FIG. **22**;

FIG. **24** is a front view of the flattened bottle;

FIG. **25** is a front view of the bottle to be bent, in which (a) is an explanatory view of the engaging piece of the bottom being engaged with the engaging piece of the handle, and (b) is a view of the other engaging piece of the bottom being engaged with the neck of the bottom;

FIG. **26** is a front view in accordance with the third embodiment of the invention;

FIG. **27** is a right side view of the bottle shown in FIG. **26**;

FIG. **28** is a plane view of the bottle shown in FIG. **26**;

FIG. **29** is a bottom view of the bottle shown in FIG. **26**;

FIG. **30** is a cross sectional view of the bottle along line A-A of FIG. **26**;

FIG. **31** is a cross sectional view of the bottle along line B-B of FIG. **26**;

FIG. **32** is a longitudinal sectional view of the bottle bottom;

FIG. **33** is a front view of the reversely deformed bottle;

FIG. **34** is a cross section view of the bottle, in which (a) is a cross sectional view thereof along line A-A of FIG. **33** and (b) is a cross sectional view along line B-B of FIG. **33**;

FIG. **35** is a front view of the flattened bottle;

FIG. **36** is a front view of the bent waste bottle;

FIG. **37** shows the first example of the bent and deformed portion of the handle, in which (a) and (b) are a side view and a front view of the handle respectively;

FIG. **38** shows the second example of the bent and deformed portion of the handle, in which (a) and (b) are a side view and a front view of the handle respectively;

FIG. **39** shows the third example of the bent and deformed portion of the handle, in which (a) and (b) are a side view and a front view of the handle respectively;

FIG. **40** shows the forth example of the bent and deformed portion of the handle, in which (a) is a side view of the handle and (b) is a cross sectional view along line A-A of (a);

FIG. **41** is an explanatory view of the forth example of the bent and deformed portion of the handle, in which (a) and (b) are a side view and a front view of the handle respectively;

FIG. **42** shows the fifth example of the bent and deformed portion, in which (a) is a front view of the upper portion of the bottle, and (b) is a side view of the upper portion of the bottle and the handle;

FIG. **43** shows the sixth example of bending rib of the bent and deformed portion, in which (a) and (b) are a front view and a side view of the upper portion of the bottle and the handle respectively;

FIG. **44** shows the seventh example of an alternative example of the bottle neck and the engaging piece, in which (a) is a perspective view of the bottle neck, and (b) is a vertical cross sectional view of the bottle bottom;

FIG. **45** shows the eighth embodiment of the bottom neck and the bottom, in which (a) is a perspective view of the bottle neck and (b) is an upper face view of the engaging member;

FIG. **46** is a cross sectional view of the hanging member, in which (a) shows the hanging ring and (b) shows the hanging bar;

FIG. **47** shows the ninth example of the bottle neck and the bottom, in which (a) is an upper view of the engaging member, (b) shows a hanging pin of the hanging member, and (c) also shows a hanging piece;

FIG. **48** shows the tenth example of the engaging means of the bottle neck and the bottom, in which (a) is an upper view of the engaging member, and (b) (c) shows a hole of the hanging member respectively;

FIG. **49** shows the eleventh example of a cap attached with the engaging member, in which (a) is a perspective view of the cap, and (b) is a perspective view of the cap in state of turning the engaging member;

FIG. **50** is a partially cut-away front view of the example of the bottle provided with a handle which is separately manufactured;

FIG. **51** is a right side view of the bottle shown in FIG. **50** in which the left half portion from the right side of the handle is eliminated;

FIG. **52** is an enlarged cross sectional view along line A-A of the FIG. **50**; and

FIG. **53** is a front view of the handle limited for the example shown in FIG. **50**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The first embodiment of the present invention will be described in conjunction with accompanied drawings FIGS. **1** to **14**.

As shown in FIGS. **1** and **2**, a bottle **A1** comprises a neck **1**, a body **2** and a bottom **3**, and the body **2** includes a handle **4**.

The bottle **A1**, for example is formed by blow molding a synthetic resin such as polyolefins resin. The bottle **A1** may be made of a single layer synthetic resin or of multi-layered one.

A lateral rib collar (ring) **5** and a holding lip **6** are provided around an outer circumference of the neck **1**.

The body **2** comprises an upper body **7** including the handle **4** and a lower body **8** having a circular cross sectional shape. The upper body **7** comprises a shoulder wall **9** having a semi-spherical shape adjacent to the neck **1**, a circumferential wall **10** adjacent to the shoulder wall **9** with a ridge line, and a bulged circumferential wall **11** having a circular cross section.

The circumferential wall **10** comprises a side wall **13** formed between the shoulder wall **9** and the bulged circumferential wall **11**, and an inwardly curved wall **14** curved to a direction of an axis of the bottle for receiving the handle.

As shown in FIG. **3**, the side wall **13** comprises a left side wall **15***a*, a front-left side wall **15***b* adjacent to the left side wall **15***a*, a rear-left side wall **15***c* adjacent to the left side wall **15***a*, a front side wall **16***a*, and a rear side wall **16***b*. The side wall **13** is formed by a slightly inwardly curved surface, and includes a ridge line **17** extending between a lower edge of the shoulder **9** and an upper edge of the bulged circumferential wall **11** (FIGS. **1** and **3**).

The "left", "right", "front" and "rear" sides as referred in this specification mean a position and a direction with respect to the bottle axis in a front view and a plane view. The "right" side means the side of the bottle where the handle is attached.

Each of the front side wall **16***a* and the rear side wall **16***b* has the curve surface same as respective side walls **15***a*, **15***b*, **15***c*. The front side wall **16***a* connects with the front-left side wall **15***b* via the ridge line **17***a*, and the rear side wall **16***b* connects with the rear-left side wall **15***c* via the ridge line **17***b*. The front side wall **16***a* includes a ride line **18***a* on the other side of the ridge line **17***a*, and the rear side wall **16***b* includes a ridge line **18***b* on the other side of the ridge line **17***b*.

The inwardly curved wall **14** is adjacent to the front side wall **16***a* and the rear side wall **16***b* respectively through ridge lines **18***a*, **18***b*. The wall **14** is a surface slightly inwardly curved in a longitudinal cross section spaced from the axis of the bottle, and has a cross sectional shape of an arch.

At a center of the wall **14** in an axial direction of the bottle, lateral ribs **19**, **19** are formed on both sides of a center portion **1400** (FIG. **5**).

The wall **14** is connected with the bulged wall **11** to form a wall surface **20** connected to a right side portion of the lower body **8**.

As illustrated in FIGS. **1**, **2** and **3**, facing to the wall **14**, the handle **4** is extended from the shoulder **9** and the upper end of the wall **14** to the wall surface **20** provided at a periphery of the wall **11**. In the illustrated embodiment, the handle **4** is integrally formed with the upper body **7** of the bottle. As shown in FIG. **5** throughout figures, the horizontal cross section of the handle **4** is formed in an arch shape having different radius dimensioned inside and outside.

At a middle of the longitudinal direction, the handle **4** is formed with a middle bulged portion **21** having a large width. An outer surface of the middle bulged portion **21** is formed with a stepped wall **22** which has a crescent shape from the right side view.

Since the handle has the wide bulged portion at the middle of the longitudinal direction, when the bottle is formed by oriented blow-molding, the middle bulged portion **21** is largely oriented. Thus, the middle bulged portion **21** is formed to be somewhat thin, so that it can be easily bent.

A downward rib **23** is formed between an upper end of the handle **4** and the curved wall **14**.

As shown in FIGS. **1** and **2**, the lower body **8** comprises a cylindrical wall **30** and a bottom circumferential wall **31**. The cylindrical wall **30** has a circular cross sectional shape, and is adjacent to the bulged circumferential wall **11** via a step. The bottom circumferential wall **31** has a greater diameter than the cylindrical wall **30**.

As illustrated in FIG. **1**, a front surface of the cylindrical wall **30** is formed with a longitudinal rib **32** downwardly extending from an upper end of the wall **30**.

A rear surface of the cylindrical wall **30** is also provided with a longitudinal rib at opposite to the longitudinal rib **32** in a radius direction. The cylindrical wall **30** is also provided with inclined ribs **33***a*, **33***b* extending downwardly and laterally from a point spaced apart from a lower end of the longitudinal rib **32**. Each of the inclined ribs **33***a*, **33***b* extends to the bottom circumferential wall **31**.

A right side circumferential surface **30***b* of the cylindrical wall **30** is formed with an arcuate rib **34**. The rib **34** connects an upper end of the longitudinal rib **32** provided on the front surface to an upper end of the longitudinal rib provided on the rear surface. The rib **34** has an arch shape of which bottom end coincides with a center line of the right side circumferential surface. The right side wall **30** is formed with a lateral rib **35** spaced from the lower ends of longitudinal ribs **32***a*, **32***b*.

In the illustrated embodiment, a left side wall surface **30***a* and a right side wall surface **30***b* are respectively formed with wide concave grooves **36** vertically with same intervals.

As shown in FIG. **6**, each of the lateral ribs **19**, **35**, the longitudinal rib **32**, the inclined ribs **33***a*, **33***b*, the downward rib **23** and the arcuate rib **34** is a concave rib having an arch shaped cross section, and acts as a bending rib **37** for squeezing and deforming the bottle.

In case of squeezing and deforming the bottle, the bottle is not bent along a longitudinal direction of the rib, while the rib is deformed along a cross direction thereof, and a connecting portion **38** between the rib and the wall of the bottle is bent. Thus, the wall of the bottle is bent at both sides of the rib, while the bending rib **37** acts as a bending line.

When the bottle is largely bent, plastic deformation occurs beyond elastic deformation at the connecting portion **38** or at a bottom **39** of the rib, so as to keep a deformed form of the bottle.

Although the bending rib **37** is a concave rib in the illustrated embodiment, a protruded rib may be used.

As illustrated in FIGS. **4** and **7**, the bottom **3** of the bottle comprises a bottom wall **40** and a bottom end wall **41** which is provided at a periphery of the wall **40** and connects to the bottom circumferential wall **31** of the body **2** of the bottle. The bottom wall **40** includes a most depressed portion **40***a* which coincides with a parting line, and is positioned left side from a center of the parting line. The bottom wall **40** is formed by a curved wall extend from the most depressed portion **40***a* to the bottom end wall **41**.

The bottom wall **40** is provided with a hanging piece **43** extending laterally along the parting line. The hanging piece **43** is formed with a hook **42** protruding inwardly at an end of the hanging piece.

The hanging piece **43** is provided near the bottom end wall **41** at a root portion thereof. The hook **42** is provided below the most depressed portion **40***a*.

A strip **44** is formed on the bottom wall **40**, and extends from the root portion of the hanging piece **43** along the parting line, so as to reinforce the bottom wall **40**.

Recessed portions **45** are formed on the bottom end wall **41** at front and rear opposite positions relating to the parting line. Notches **46** are oppositely provided along the parting line.

A way of squeezing the bottle will be described hereinbelow.

A bottle can be effectively squeezed if the bottle is put on a table in a manner a handle on the right side of the bottle is faced upward (when the bottle is put on the table, the "right" and "left" of the bottle side becomes "up" and "down", and the "front" and "rear" side of the bottle becomes the "left" and "right" side respectively, however each previous direction will be referred hereinafter).

In summary, the bottle is squeezed by pressing the body **2** or the neck **1** by a hand first so as to bend the middle portion of the handle **4**.

Next, an upper portion of the lower body **8** is pressed inwardly and then a lower portion thereof is pressed inwardly, so as to bend the left and right walls of the lower body wall **8** at the longitudinal rib **32** as a bending line, to deform and depress the left and right circumferential walls, so that the circumferential wall **10** of the upper body **7** is deformed and depressed.

Then, the bottom **3** of the bottle is folded to obtain a flattened waste bottle.

Further, the flattened waste bottle may be bent, and the hanging piece **43** with the hook **42** may be engaged with upper edge of the neck **1**, so that the waste bottle can be further deformed and depressed.

Next, the following is an explanation of indications showing an order of the operation for squeezing the bottle, which are formed at the predetermined place.

As shown in FIG. **2**, an indication **47***a* "1 Push" is formed on an outer surface above the stepped wall **22** of the middle bulged portion **21** of the handle **4**. In FIG. **2**, the indication is illustrated as "1 P".

An indication **47***b* of "2 Push" is formed on the cylindrical wall **30** above the arcuate rib **34**. An indication **47***c* of "3 Push" is formed on the cylindrical wall **30** above the lateral rib **35**.

On the bottom wall **40**, an indication **47***e* of "5 Bending Bottle" is formed as illustrated in FIG. **4**.

Next, the order of squeezing and functions thereof will be detailed with reference to accompanied drawings.

The bottle neck **1** or the body **2** is held by a hand, and the indication **47***a* formed on the middle portion of the handle **4** in the longitudinal direction thereof is pressed inwardly.

When a bending force is applied to the handle **5**, the handle **4** is bent along a bending line of the downward rib **23** as illustrated in FIG. **8**, so that the handle is inwardly bent at a portion below the stepped wall **22** of the middle bulged portion **21**.

At the same time, the upper body is pressed to be somewhat deformed partially.

Consequently, the indication **47***b* formed on the upper side of the cylindrical wall **30** is pressed inwardly (an arrow a illustrated in FIG. **8**) to apply the bending force to both the bulged circumferential wall **11** and the right side circumference wall **30***b* of the body cylinder wall **30**, so that as shown in FIG. **9**, the right side wall **30***b* is bent along the bending line of the arcuate rib **34** to press the right side portion of the bulged wall **11** inwardly.

Furthermore, when the indication **47***c* on the lower portion of the cylindrical wall **30** is pressed inwardly (an arrow b as shown in FIG. **9**), the lower portion of the right side **30***b* is bent along the bending line of lateral rib **35**, and the bottom circumference wall **31** is also bent along the lateral rib **35**, as illustrated in FIG. **10**.

Resultantly, the left and right side **30***a*, **30***b* of the cylindrical wall **30** are bent along the longitudinal rib **32** respectively, so that the cylindrical wall **30** can be flattened. In this case, the longitudinal ribs **32** and the vicinity thereof are protruded forwardly and backwardly (FIG. **12**).

The flattening of body cylinder wall **30** will effect on the circumferential wall **10** of the upper body **7**.

Each of the front side wall **16***a* and the rear side wall **16***b* is hardly bent circumeferentially, because the lateral rib **19** extends from the inwardly curved wall **14** to these walls **16***a*, **16***b*. Thus, the body circumference wall **10** is bent along the ridge line **17***a* between the front-left side wall **15***b* and the front side wall **16***a* and along the ridge line **17***b* between the rear-left side wall **15***c* and the rear side wall **16***b* as a bending line, so that the circumferential wall **10** deformed and protruded forwardly and rearwardly.

Next the indication **47***d* of the bottom **3** is pressed as shown by an arrow c in FIG. **10**, so that the bottom **3** is bent along the lateral rib **35** of the right side circumferential wall **30***b*, so as to close the right side surface **30***b* and the right half portion of the bottom wall **31** more, and the bottom wall **40** is further bent.

The body **2** becomes a flattened body **2***a* as shown in FIGS. **11**, **12** to obtain the flattened bottle for disposal.

In this case, the flattened manner can be maintained by a plastic deformation occurred around the bent, bulged and other portions.

Although the flattened bottle obtained as described above can be dumped or wasted, said flattened bottle for disposal may be further folded to obtain a smaller bottle.

The neck **1** and the bottom **3** are held by a hand, and a bending force M (FIG. **11**) is applied, the bottom **3** is pressed by the flat body **2***a* to be further flattened, the circumferential wall **10** is bent along the bending line of the lateral rib **19**, and the handle **4** is further bent accordingly.

The handle **4** is further bent at the downward rib **23** and the stepped wall **22**. At the lower portion of the stepped wall **22**, the width of the middle bulged portion **21** is further increased, and a plastic deformation occurs, so that the middle portion of the handle is further flattened. An inner surface of the stepped wall **22** contacts with the inwardly curved wall **14** of the circumferential wall **10**.

The bending force M (FIG. **13**) is further applied, the flat body **2***a* is further bent, so that thereby the bottom wall **40** contacts with the neck **1**.

In this manner, the hook **42** of the hanging piece **43** on the bottom wall **40** is engaged to an inner surface of the neck **1**, so that the neck **1** and the bottom **3** can be kept to be contact each other, so as to obtain the smaller bottle of the folded flat body **2***a* as shown in FIG. **14**.

For flattening and squeezing the bottle, due to the plastic deformation of the flat body **2***a*, the body **2***a* is not recovered except of adding the external force. However, it may be considered that the plastic deformation does not occur at the bent flat body **2***a*. Thus, the neck **1** and the bottom **3** are engaged with each other to prevent the bent and folded flat body **2***a* from recovering when the bottle is dumped or wasted.

As described above, the waste bottle folded to be less quantity can be obtained.

When the bottle is arranged on the table in which the handle is positioned upwardly as described above, the bottle can be effectively squeezed by only pressing the right side of the bottle inwardly, because a reactive pressure is applied to the left side of the bottle. If the bottle is squeezed by grasping the bottle by both hands, the bottle can be squeezed by pressing from both sides in accordance with the order described hereinbefore.

In this case, the circumferential wall of the upper body together with the handle is pressed from both side so as to deform the upper body wall simultaneously with bending the handle.

Thereafter the lower body is squeezed. Alternately the lower body is pressed to deform at first, then the handle and the upper body may be pressed to deform.

Second Embodiment

The second embodiment will be described with reference to FIGS. **15** to **25**. In the second embodiment, respective shape of the handle and the body, especially an arrangement of a bending and deformed portion of the handle and the bending rib of the body are altered.

As shown in FIGS. **15** and **16**, in the second embodiment, a bottle A**2** comprises a neck **50**, a body **51** and a bottom **52**, and the body **51** includes a handle **53**.

The bottle A**2** is formed by blow molding polyolefins resin and other synthetic resins for example, and may be molded from a single layer synthetic resin or from multi-layered one.

A bulged collar or ring **54** and a holding protruded lip **55** are provided around an outer circumference of the neck **50**.

The body **51** comprises an upper body **56** with the handle **53** and a lower body **57** having a circular cross sectional shape. The upper body **56** comprises a semi-spherical shoulder wall **58** connected to the neck **50**, a circumferential wall **59** with a ridge-line adjacent to the wall **58**, and a bulged circumference wall **60** having a circular cross sectional shape.

The circumferential wall **59** comprises a side wall **62** between the shoulder wall **58** and the bulged circumferential wall **60** and an inwardly curved wall **63** curved in an axis direction.

As shown in FIG. **17**, the side wall **62** comprises a left side wall **64***a*, a front-left side walls **64***b* adjacent to the left side wall **64***a*, a rear-left side wall **64***c* adjacent to the left side wall **64***a*, a front wall **65***a*, and a rear wall **65***b*. The side wall

62 is formed by a slightly inwardly curved surface, and includes a ridge line 66 extending between a lower edge of the shoulder 58 and an upper edge of the bulged wall 60 (FIG. 15 and FIG. 17).

The inwardly curved wall 63 is adjacent to the front wall 65*a* and the rear wall 65*b* through arcuate ridge-lines 67*a*, 67*b* and is formed from curved surfaces as well as the first embodiment. At a vertical middle portion of a longitudinal direction of the inwardly curved wall 63, a lateral rib 68 is formed to extend to the front wall 65*a* and the rear wall 65*b* (FIGS. 15, 16 and 19).

As shown in FIGS. 15 to 17, as well as the first embodiment, facing to the inwardly curved wall 63, the handle 53 is extended from the shoulder 58 and the upper end of the inwardly curved wall 63 to a wall surface 69 provided at a periphery of the bulged circumferential wall 60. In the illustrated embodiment, the handle 53 is integrally formed with the upper body 56. As shown in FIG. 19, the handle 53 is formed its inside an arcuate cross section.

At a middle of the longitudinal direction, the handle 53 is formed with a middle bulged portion 70 having a wide width. An outer surface of the middle bulged portion 70 is formed with stepped walls 71*a*, 71*b* with vertical intervals. The outer surface of the handle between walls 71*a* and 71*b* is protruded.

A concave portion 72 is formed to depress from the protruded surface between the stepped walls 71*a*, 71*b*.

The handle 53 is provided with an engaging piece 73 extending upwardly. The engaging piece 73 is provided at an upper end thereof with a hook 74 protruded inwardly.

The shoulder wall 58 is formed with a flat portion 75 at a portion facing to the engaging piece 73.

As well as the first embodiment, the lower body 57 is adjacent to the bulged circumferential wall 60, and comprises a cylindrical wall 80 having a circular cross section and a bottom circumferential wall 81 having a greater diameter than the cylindrical wall 80.

Two longitudinal ribs 82*a*, 82*b* are formed on a left side circumferential surface 80*a* of the cylindrical wall 80. Each of the longitudinal ribs extends to the bottom circumferential wall 81. On the bottom wall 81, arcuate lateral rib 83 is formed which connect respective lower end of the longitudinal ribs with each other.

On a right side circumferential surface 80*b* of the cylindrical wall 80, a lateral rib 84 is formed adjacent to the bulged wall 60. Longitudinal ribs 85*a*, 85*b* are downwardly extended from both ends of the lateral rib 84.

Each of the longitudinal ribs 85*a*, 85*b* extends to the bottom circumferential wall 81. An arcuate lateral rib 86 is formed on the bottom wall 81 to connect with lower ends of the longitudinal ribs.

As shown in FIG. 20, the longitudinal ribs 82*a*, 82*b*, 85*a*, 85*b* are symmetrically arranged from a center line with having an angle of 45° respectively. Each of ridge lines 66*a*, 66*b* of the front and rear walls 65*a*, 65*b* coincides with each of the longitudinal ribs 82*a*, 82*b*.

Each of the lateral ribs 68, 83, 84, 86 and the longitudinal ribs 82, 85 is a concave rib and acts as a bending rib, as well as described in the first embodiment.

As shown in FIGS. 18 and 21, the bottom 52 comprises a bottom wall 90 and a bottom end wall 91 which is provided at a periphery of the bottom wall 90 and connects with the bottom wall 81 of the body 51. Two hanging pieces 93*a*, 93*b* are formed on the bottom wall 90 along a parting line. Each of the hanging piece 93*a*, 93*b* is provided at its end with a hook 92 protruding inwardly.

The bottom end wall 41 is provided with recessed portions 94 at front and rear opposite positions with respect to the parting line, and notches 95 on the parting line.

A method of squeezing the bottle will be described hereinbelow.

The way of squeezing is summarized herewith. The body 51 is pressed inwardly to reverse or invert the wall to decrease the volume of the bottle. Then, the body 51 is squeezed to form a flat body 51*a*, the handle 53 is also squeezed, and then the bottom is bent to obtain the flattened bottle for disposal.

Further, the flattened upper body 56 may be bent on the lateral rib 68, the flattened body 51*a* may be bent so as to contact the neck 50 with the bottom 52, and finally one of the hooks 92 of hanging pieces 93*a*, 93*b* of the bottom wall 90 may be engaged with the neck 50 or the hook 74 of the handle 53, to obtain a smaller flattened bottle for disposal.

Next, the function or effect of squeezing the bottle will be described with reference to accompanied drawings.

When the cylindrical wall 80 of the lower body 57 is pressed inwardly, the left side circumferential wall 80*a* is reversed or inwardly deformed around the longitudinal ribs 82*a*, 82*b* as shown in FIGS. 22 and 23 (*b*), and the left side wall of the bottom circumferential wall 81 is bent along the folding line of lateral rib 83.

The right side circumferential wall 80*b* of the cylindrical wall 80 is reversed inwardly around the lateral rib 84 and the longitudinal ribs 85*a*, 85*b*. The right side of the bottom circumferential wall 81 is bent along the folding line of the lateral rib 86.

When the circumferential wall 59 of the upper body 56 is pressed inwardly, the side wall 62 is reversed or inwardly deformed around the ridge lines 66*a*, 66*b*, and the bulged circumferential wall 60 is also reversed around an axis coinciding with the longitudinal rib 82*a* and the ridge line 66*a* and around an axis coinciding with the longitudinal rib 82*b* and the ridge line 66*b*.

In this case, the deformation of the left side circumferential wall 80*a* of the lower body 57 causes the reversion of the left side wall of the upper body 56 to be easily.

The thus obtained bottle is deformed in a manner illustrated by FIGS. 22 and 23.

When the lower body 57 as illustrated in FIG. 22 is pressed inwardly from left and right sides, the cylindrical wall 80 of the lower body 57 is also bent along a folding line vertically extending between the longitudinal ribs 82*a* and 82*b*, thereby to protrude forwardly and rearwardly directions, so as to flatten the cylindrical wall 80.

Next, the circumferential wall 59 of the upper body portion 56 is pressed inwardly from left and right sides. Since the front wall 65*a* and the rear wall 65*b* includes the lateral rib 68 extending to the curved wall 63, the front wall 65*a* and the rear wall 65*b* cannot be bent. Therefore, the circumferential wall 59 is bent around the folding line of the ridge lines 66*a*, 66*b* to protrude forwardly and rearwardly. Since a lower portion of the circumferential wall 59 is affected by effected by the bending and protruding of the lower body 57, the deformed circumferential wall 59 forms a curve line connecting with the protruded lower body 57.

In this case, plastic deformation occurs at the bent, protruded portions and on other portions so as to keep the bottle in a flattened manner.

Next, the neck 50 or the bulged circumferential wall 60 is grasped and a bending force is applied to the handle 53. The handle 53 is bent around the concave portion 72 of the middle bulged portion 70 or around the stepped wall 71*b*, as illustrated in FIG. 24.

At that time, the right side circumferential wall of the bulged circumferential wall **60** is difficult to deform due to the presence of the wall surface **69**. However, the bent handle **53** causes the right side wall of the bulged circumferential wall **60** to be pulled upwardly, the bulged circumferential wall **60** is largely deformed together with the deformation of the circumferential wall **59** and the left side wall **80***a* of the cylindrical wall **80**.

As a result of the described above, the volume of the upper body **56** is decreased and the lower body **57** is flattened, so that the body **51** is deformed to a flat body **51***a*.

Since the neck **50** and the shoulder **58** are thick, they are not deformed.

Next, the bending force is applied to the bottom **52** to bend it toward the flat body **51***a* to deform the bottle as shown in FIG. **24**, thereby the flattened bottle for disposal can be obtained.

The thus obtained flattened bottle for disposal may be further folded. When the bending force M is applied to the neck **50** and the bottom **52** illustrated in FIG. **24**, the front wall **65***a*, the rear wall **65***b* and the curved wall **63** are bent around the folding line of the lateral rib **63**, so that the circumferential wall **59** of the upper body **56** is bent furthermore. Then the bending force M is further applied, the flat body **51***a* is bent, so that the neck **50** contacts with the bottom wall **90**.

In a manner as described above, the hook **92** of the hanging piece **93***b* of the bottom wall **90** is engaged with the hook **74** of the handle **53**. Alternatively, the hook **92** of the hanging piece **93***a* is engaged with an inner surface of the neck **50**, so as to keep the neck **50** and the bottom **52** in an engaging manner, so that the bottle for disposal can be largely deformed as shown in FIGS. **25** (*a*), (*b*).

Since plastic deformation occurs, the flat body **51***a* cannot be recovered to its original shape without adding the external force. However, it may be considered that the flat body **51***a* is insufficiently deformed to occur the plastic deformation. In such a case, the engagement of the neck **50** with the bottom **52** prevents the folded flat body **51***a* from recovering its original shape.

Resultantly the folded bottle for disposal having a considerably little volume can be achieved.

The effect of providing two hanging pieces **93***a*, **93***b* on the bottom wall will be described herewith. In case of engaging the hanging piece **93***a* with the inner surface of the neck **50**, the bottle cannot be put the cap, while the position of the hanging piece **93***a* and the neck **50** is easily confirmed to engage therewith.

In case of engaging the hanging piece **93***b* with the hook piece **73** of the handle **53**, it is possible to waste the bottle with the cap.

For a requirement of wasting the bottle separately from the cap by a reason of different material resin between the bottle and the cap, the use of hanging piece **93***a* or **93***b* can be selected if desired.

The Third Embodiment

The third embodiment in accordance with FIGS. **26** to **36** will be described herein. In this embodiment, the shape of the lower body and the arrangement of bending ribs are respectively altered.

As shown in FIGS. **26** and **27**, a bottle A**3** comprises a neck **101**, a body **102** and a bottom **103**, and the body **102** includes a handle **104**.

The bottle A**3** is formed by a blow molding of synthetic resins such as polyolefins and the like. The bottle A**3** may be formed from a single layer of synthetic resin or from a multi-layered one.

A bulged collar or ring **105** and a protruded lip **106** are provided on an external circumference of the neck **101**.

The body comprises an upper body **107** including the handle **104** and a lower body **108** having a rectangular cross sectional shape. Each of the upper body **107** and the lower body **108** has an equilateral octagonal cross section and includes eight surfaces.

The upper body **107** comprises a semi-spherical shoulder wall **109** connected to the neck **101** and a circumferential wall **111**. The lower body **108** comprises a lower body wall **112** having an octagonal cross sectional shape and a bottom circumferential wall **113** adjacent to the wall **112**.

The body wall **112** has less diameter than the wall **111**, and is adjacent to the circumferential wall **111** via a stepped wall **114**. A stepped wall **115** is also provided between the body wall **112** and the bottom circumferential wall **113**.

As shown in FIGS. **26**, **28** and **30**, the circumferential wall **111** includes three walls **116** arranged in a left side, a front wall **117**, a rear wall **117**, three walls **118** arranged in a right side, an inwardly curved wall **119** adjacent to the front and the rear walls **117**, and a wall **120** adjacent to an upper edge of the wall **118** and a lower portion of the curved wall **119**.

The wall **116** arranged in the left side comprises a left side wall **116***a*, a front-left side wall **116***b* adjacent to the left side wall **116***a*, and a rear-left side wall **116***c* adjacent to the left side wall **116***a*. The wall **118** arranged in the right side comprises a right side wall **118***a*, a front-right side wall **118***b* adjacent to the right side wall **118***a*, and a rear-right right side wall **118***c* adjacent to the right side wall **118***a*.

Each of the walls **116***a*, **116***b*, **116***c*, **117***a* and **117***b* is formed of a outwardly curved surface including a ridge line **121** which connects with a lower edge of the shoulder wall **109** and the stepped wall **114**. Each of walls **118***a*, **118***b* and **118***c* is formed of a plan surface.

Each of right side edges of the front wall **117** and the rear wall **117** is formed to be an arcuate ridge line **122**. The inwardly curved wall **119** is formed of a curved surface adjacent to the arcuate ridge line **122**. A lateral rib **123** is formed in the inwardly curved wall **119** at a middle in an axial direction, and extends to the front wall **117***a* and the rear wall **117***b*.

As shown in FIGS. **26** and **27**, the handle **104** extends from an upper end of the shoulder wall **109** and the curved wall **119** to the wall **120**, and faces to the inwardly curved wall **119**. In the illustrated embodiment, the handle **104** is integrally formed with the upper body **107**. As shown in FIG. **30**, the handle **104** has a cross sectional shape having an arcuate inside.

The handle **104** is provided with a middle bulged portion **124** at a middle portion in the longitudinal direction. The middle bulged portion **124** is provided in an outer surface with stepped walls **125***a*, **125***b* spaced apart from each other. Between the stepped walls, the outer surface of the handle is protruded.

In the protruded surface between the stepped walls **125***a*, **125***b*, a concave portion **126** is formed.

The handle **104** is provided with an engaging piece **127** upwardly protruded. The engaging piece **127** has a hook **128** inwardly protruded in its upper end.

The shoulder wall **109** is partially formed with a flat portion **129** facing the engaging piece **127**.

As shown in FIGS. **26**, **27** and **31**, the body wall **112** of the lower body **108** comprises a left side wall **130**, a right

side wall **131**, a front-left side wall **132***a*, a rear-left side wall **132***b*, a front-right side wall **133***a*, a rear-right side wall **133***b*, a front wall **134***a* and a rear wall **134***b*. Each of the walls is adjacent with each other through the ridge line **121**.

Slanted ribs **135***a*, **135***b* are formed on the left side slanted walls **132***a*, **132***b*. Respective ribs **135***a*, **135***b* extend from the left side lower end of slanted walls **132***a*, **132***b* toward the vicinity of the ridge line **121***a*.

In the walls **132***a* and **132***b* positioned at right side, ribs **136***a*, **136***b* are formed on the right side slanted walls **133***a*, **133***b* symmetrically with slanted ribs **135***a*, **135***b*. A lateral rib **137** is formed on an lower end portion of the right side wall **131**.

A lateral rib **138** is provided extending on respective upper ends of the walls **133***a*, **133***b* and **131**. Each of the front-right side wall **133***a*, the rear-right side wall **133***b* and the right side wall **131** is adjacent to the stepped wall **114** via the lateral rib **138**.

Each of the ribs **123**, **137**, **138**, **135** and **136** acts as a bending rib having an arcuate cross section, as well as the first and second embodiments.

As shown in FIGS. **29** and **32**, the bottom **103** comprises a bottom wall **140** and a bottom end wall **141** which is provided at a periphery of the bottom wall **140** and connects to the bottom circumferential wall **113** of the body **102**. Two hanging pieces **143***a*, **143***b* are formed on the bottom wall **140** along the parting line. A hook **142** is formed in respective ends of hanging pieces **143***a*, **143***b*, and protrudes inwardly.

The bottom end wall **141** is formed with recessed portions **144** at front and rear opposite positions with respect to the parting line, and notches **145** oppositely provided on the parting line.

A method of squeezing the bottle according to this embodiment will be describe hereinbelow.

The way of squeezing is summarized herewith. The body walls of the lower body **108** and the upper body **107** are reversed to decrease the volume, the body **102** is pressed to flatten, and then the handle **104** is bent to obtain the flattened bottle for disposal.

Further, if necessary, the flattened body **102***a* is curved by bending the upper body **107** to obtain the further squeezed bottle.

Next, the function or effect of squeezing the bottle will be described with reference to accompanied drawings.

First, the lower body **108** of the bottle A**3** is pressed inwardly. As shown in FIGS. **33** and **34** (*b*), the wall **130**, **132***a* and **132***b* are reversely deformed around the ridge line **121** and the inclined rib **135**.

In accordance with the reverse of the side wall **130**, the bottom circumferential wall **113** is also deformed.

The right side of the lower body **108** is reversely deformed around the axis of the ridge line **121** between the walls **133** and **134**. The wall **131** is reversed around the lateral rib **138** and **137** formed in upper and lower ends. Corresponding to the reverse of the side wall **131**, the walls **133***a* and **133***b* are bent around the folding line of the ridge line **121** and the ribs **136***a*, **136***b*, and are deformed to a curved manner.

Next, when the circumferential wall **111** of the upper body **107** is pressed inwardly from both sides, the left half side walls **116***a*, **116***b*, **116***c* are reversely deformed around the axis of the ridge line **121**, as shown in FIG. **34** (*a*).

Since the lateral rib **123** is formed, the front and rear walls **117** are folded around the arcuate ridge line **122**, the ridge line **121** is protruded forwardly and rearwardly. Since the wall **116** has been reversed, the ridge line **121** is kept its protruded manner.

The reverse of the upper body **107** maintains the reverse of the lower body **108**, so as to certainly prevent the lower body **108** from recovering.

Resultantly, a reversed bottle which volume is decreased is obtained as shown in FIGS. **33** and **34**.

Next, when the lower body **108** as illustrated in FIG. **33** is pressed inwardly from left and right sides, the body wall **112** of the portion **108** protrudes its middle portion forwardly and rearwardly, so as to be flattened.

Then, the circumferential wall **111** of the upper body **107** is pressed from left and right sides. Since the lateral rib **123** is formed from the inwardly curved wall **119**, the front wall **117***a* and the rear wall **117***b* are difficult of bending. Thus, the ridge line **121** between the walls **116***b* and **117***a* and the ridge line **121** between the walls **116***c* and **117***b* are protruded forwardly and rearwardly.

Then, when the neck **101** or the upper body **107** is grasped and the bending force is applied to the handle **104**, the handle **104** is bent around the concave portion **126** of the middle bulged portion **124** or the stepped wall **125***b*, as shown in FIG. **35**.

Because of the wall **120**, the walls **118***a*, **118***b* and **118***c* of the upper body **107** are difficult to be deformed. Thus, the walls **118***a*, **118***b* and **118***c* are deformed to be slightly flat, corresponding to the left side deformation of the body **102**.

The thus obtained body **102** is deformed into the flat body **102***a* in which the volume of the upper body is decreased and the lower body is flattened.

At this time, the neck **101**, the shoulder wall **109** and the bottom wall **140** are kept their original shape without deformation.

Next, the bending force is applied to the bottom **103**, the bottom **103** is folded in respect of the flat body **102***a*, so as to be deformed as shown in FIG. **35**, thereby the flattened bottle for disposal can be obtained.

Then, when the bending force M is applied on the neck **101** and the bottom **103** as illustrated in FIG. **35**, the front wall **117***a*, the rear wall **117***b* and the inwardly curved wall **119** are folded around the lateral rib **123**, so that the circumferential wall **111** of the upper body **107** is curved or deformed.

The bending force M is further applied, the flat body **102***a* is bent such that the neck **101** contacts with the bottom wall **140**.

In this state, when the hook **142** of the hanging piece **143***b* mounted on the bottom wall **140** is engaged with the hook **128** of the engaging piece **127** of the handle **104**, or when the hook **142** of the hanging piece **143***a* is engaged with inner surface of the neck **101**, the neck **101** and the bottom **103** are kept their engagement, and the bottle is further deformed as shown in FIG. **36**.

As well as the second embodiment, plastic deformation occurs in the flat body **102***a*, and the flat body may not be recovered except of adding the external force, like the second embodiment. However the curved deformation of the flat body **102***a* is not sufficient to the plastic deformation. Thus, the curved and folded flat body **102***a* is prevented from recovering by engaging the neck **101** with the bottom **103**.

As described hereinbefore, the folded bottle which volume is considerably decreased can be obtained.

Now each modified examples common with respective embodiments will be described.

In respective embodiments, the handle is integrally formed with the body of the bottle at the time of a blow molding. However, the conventional handle which is separately molded may be integrated with the body by an insert molding at a blow molding.

FIGS. **50** to **53** show a bottle with a handle separately formed as a member independent from the bottle. A handle comprises a grip plate **411** and a securing beam plate **412** and on a middle portion of the axial direction of the handle, bending portions **416**, **417** are formed on the plate **411**, **412** respectively. In the illustrated example, respective bending portions **416**, **417** are thin, however the shape of bending portions may not be limited to the illustrated example. In the illustrated example, the bending portion **416** is formed on an inner surface of the board **411** to keep an appearance of the handle and the bottle, the invention may not be limited to the example as illustrated. Further the shape of the handle may not be limited to the example as illustrated either. Although in FIGS. **50** and **51**, ribs effecting as a bending rib is not shown on the bottle body, ribs disclosed by embodiment described hereinbefore can be formed.

The bending portion such as a concave groove is mounted on a middle surface of the handle and the upper body can be easily curved by squeezing the handle at the time of wasting or by removing it from the body to achieve effects as described hereinbefore. In case of eliminating the bending portion from the handle, the handle may effect on the bottle as an reinforce vertical beam and may deteriorate squeezing effect to decrease the volume of the bottle for wasting it, however conventional problem will be solved by the invention to form the bending portion on the handle.

Each embodiment has a structure for providing a bottle to be folded, however a part of these constructions may be eliminated for wasting a flattened bottle for disposal.

That is, in the first embodiment, for wasting the flattened bottle, the bottom needs not to be engaged with the neck, and the engaging piece on the bottom wall can be eliminated.

Further in the second and the third embodiments, the engaging piece of the bottom wall and the engaging piece of the handle can be also eliminated from the structure of the invention.

For the case of the flattened bottle, the upper body needs not to be deformed to be curved by applying the bending force on the neck and the bottom, and in each embodiment, an extension of lateral ribs between the curved surface and the side wall adjacent therewith will not be required.

Although in the bottle in the embodiments, the neck is provided with the bulged ring and the holding lip for engaging the cap or the inner stopper, the cover body of the bottle is not limited specifically, and a cover with a packing, a cap engaged with a stopper or a combination of a stopper and a cap may be applicable.

Further a screw type cap which the neck circumference is threaded may be used.

In each embodiment, the specific shape of the body or the bottom is described, while the flat bottle of which vertical body has a circular cross section, a rectangular cross section or an oval cross section may be used for squeezable bottle by means of bending ribs formed in predetermined portions.

EXAMPLES

Modified examples in respect of the squeezable deformed portion of the handle, the engaging member for the neck and the bottom of the folded bottle will be described.

In the first embodiment, the squeezable deformed portion of the handle comprises stepped walls provided on the surface of the middle bulged portion of the longitudinal middle portion (that is, the bending portion), and the downward rib provided along the connecting part of the body and the curved wall (that is, bending ribs). In the second and the third embodiments, said portion comprises bending portions comprising stepped walls and concave portions vertically formed on the surface of the middle bulged portion of the handle. However, other various modified examples may be applicable.

In respect of the engaging member of the neck and the bottom of the bottle, in the second and the third embodiments, for obtaining the folded bottle by providing the engaging piece on the upper end portion and providing the hanging piece on the bottom of the handle, the bottle neck and the bottom thereof is kept their engagement by engaging the engaging piece with the hanging piece, while for the engagement of the neck and the bottom, various modified examples for engaging the neck and for hanging the bottom may be applicable.

First modified examples of the bending portion provided on the longitudinal middle portion of the handle will be described.

First Example

As shown in FIG. **37**, an oval concave portion **151** is provided on an outer side of a middle bulged portion **150** of a handle **4**A, and a concave rib **152** is provided on a rear side of the handle **4**A.

The bending portion of the handle arranged through the handle **4**A is achieved by the concave **151** and the concave rib **152**.

As well as the first embodiment, the arcuate downward rib is arranged inside of the upper end of the handle **4**A along the connecting part with the curved wall.

The squeezable deforming portion of the handle is formed by the bending portion and the downward rib.

Second Example

As shown in FIG. **38**, an oval concave portion **153** is only provided for the bending portion on a surface of a middle bulged portion **150** of the handle **4**A.

The concave rib is eliminated from the arcuate portion of the rear surface, while the space between upper and lower ends of the concave portion **153** becomes narrow to squeeze the handle and due to less spaces between out and rear of the outside arcuate portion, the handle is pressed from the outside pressure to be deformed easily.

Third Example

As shown in FIG. **39**, a flat concave portion **154** which both ends designed to be arcuate is provided on the surface for the bending portion.

The space between upper and lower ends of the concave portion **154** becomes narrow to squeeze the handle, and the rear side arcuate portion is pressed as well as the second example to be deformed easily for bending the handle.

Fourth Example

As shown in FIG. **40**, an oval concave **155** is arranged on the rear surface of the middle bulged portion **150** for the bending portion.

The space between upper and lower ends of the concave portion **155** becomes wide to squeeze the handle. The

outside arcuate portion has a large arcuate radius almost to be plane for easily bending, and more easily squeezing can be achieved than the handles of the second and the third examples.

The oval concave portion is also alternative to the concave rib **152** of the first example.

Further, a concave portion or a groove may be provided on the outside.

In FIG. **41**, the rear side of the handle is provided with the concave portion **155**, and the out side is provided with a groove **156**.

For bending the handle, the out side is provided with a folder on the groove **156** to achieve more easily squeezable deformation.

Fifth Example

The bending portion may not be limited to be positioned at the middle portion exemplified as each example described hereinbefore.

As shown in FIG. **42**, an arcuate downward rib **160** is provided on the upper end inside of the handle **4**A along the connecting portion with the curved wall **14**A, and a concave portion **161** is provided for the bending portion at the lower end rear side of the handle **4**A.

The squeezable deformed portion of the handle **4**A comprises a downward rib **160** and a concave portion **161** to be a bending portion. When the middle portion of the handle **4**A is pressed for bending, the downward rib **160** and the concave portion **161** are bent as well as the first embodiment, and the middle bulged portion **150** of the handle **4**A can be easily curved.

In this example, the arcuate downward rib **160** is provided at the upper end inside of the handle **4**A. The downward rib is alternative to be a concave portion as well as **161** on the upper end rear side, and the squeezable deformed portion may comprises two concave portions provided on upper and lower end portions.

Sixth Example

The modified example of the bending rib provided on the connecting portion with the body wall will be described.

As shown in FIG. **43**, on the upper end of the handle **4**A, a lateral rib **162** is arranged on the connecting portion with a shoulder wall **9**A, and an arcuate downward rib **163** is disposed on the connecting portion with a curved wall **14**A.

The lateral rib **162** and the downward rib **163** are connected arcuately on the upper surface of the curved wall **14**A to divide the handle **4**A from the shoulder wall **9**A and the curved wall **14**A.

For folding the handle, the lateral rib **162** extends a cross wide direction to make the extension of the downward rib **163** narrow and the handle can be easily bent by the bending rib.

Seventh Example

The modified example of the engaging means of the neck and the bottom of the bottle will be described.

At first, an example of protruding the engaging piece from the neck or from the shoulder wall will be explained.

In FIG. **44**, "Aa" indicates a bottle, "**1**A" is a neck of the bottle, "**9**A" is a shoulder wall, and B is a cap covered on the neck **1**A.

A holding lip **6**A is provided around the neck **1**A, and an engaging piece **171** having a spherical head **170** is arranged between the lip **6**A.

On a bottom end wall **41**A of the bottom **3**A, a concave portion **46**A is formed at the opposite position to the parting line. On the bottom end wall **41**A in vicinity of left side or right side, or both sides concave portion **46**A, an engaging hole **173** is provided. A bottom of the hole **173** is formed in a spherical aperture **172** to engage with the engaging piece **171** on the neck **1**A is projected.

For obtaining folded bottle by a way of squeezing described above, finally the engaging piece **171** is inserted through the engaging hole **173** of the bottom **3**A, thereby the neck **1**A and the bottom **3**A are kept their engagement.

The engaging piece **171** may be projected upward of the handle from the shoulder wall **9**A to obtain the same effect.

Further, the engaging hole **173** of the bottom **3**A may be provided on the left or the right side surface of the bottom end wall **41**A.

Eighth Example

The example of attaching an independent engaging member on the bottle neck will be described.

In FIG. **45** "Aa" is a bottle, "B" is a cap, and "C" is an engaging member. "A**1**" is a bottle neck. "**6**A" is a pair of holding lips protruding arcuately from the outer circumference of the neck **1**A.

On the holding lips **6**A, the engaging member C is loaded to be held between a cap body B**1** and lips **6**A by covering the cap B thereon.

The engaging member C comprises an annular plate **180** and an engaging hook **181** extending outwardly from the plate **180** for comprising the engaging portion.

For engaging the cap B by a stopper, at first the annular plate **180** is loaded on lips **6**A of the neck and the cap B is covered thereon.

The inner diameter of the annular plate **180** is less than the outer circumference of the cap B and the thickness thereof may be sufficient to be kept on a determined position between the lower end of the cap B and the holding lip **6**A.

As shown in FIG. **46** (*a*), a semi-arcuate hanging ring **182** is vertically provided on the left side of the bottom wall **40**A along the parting line to comprise a hanging member.

The end of the hanging ring **182** is positioned in vicinity of the bottom end wall **41**A and the other end is positioned in vicinity of the central portion of the bottom wall **40***a* to downwardly project therefrom.

For obtaining the folded bottle, the hanging ring **182** of the hanging member of the bottom wall **40**A is engaged with the engaging hook **181** of the engaging member C to keep the engagement of the neck **1**A and the bottom **3**A.

A hanging bar **183** is projected outwardly from the left end of the bottom end wall **41**A of the bottom **3**A as illustrated in FIG. **46** (*b*).

The hanging bar **183** comprises a support bar **184** extending from the longitudinal direction of the parting line toward the horizontal direction and an engaging bar **185** traversing from the end of the bar **184**.

When the bar **184** of the hanging bar **183** is inserted through the engaging hook **181** of the engaging member C, due to a recover force of the flat body, the bar **184** is pressed to contact with the inner circumferential bending portion of the engaging hook **181**, so as to connect the engaging bar **185** with the side surface of the engaging hook **181**, thereby the neck **1**A and the bottom **3**A of the bottle are kept their engagement.

Ninth Example

Together with the engaging member, another example modified a structure of the hanging member of the bottle bottom will be described.

As shown in FIG. **47** (*a*), an engaging member Ca comprises an annular plate **180***a* and an arcuate engaging piece **187** which both ends connect with the outer circumference of the plate **180**. The piece **187** is formed with an insert hole **186**.

As shown in FIG. **47** (*b*), an arcuate hanging pin **188** which end has predetermined intervals from the bottom end wall **40**A is provided on the bottom **3**A.

For engaging the neck **1**A and the bottom **3**A, the engagement of the neck **1**A and the bottom **3**A is kept by inserting to engage a hanging pin **188** into the engaging piece **187**.

The hanging member of the bottom **3**A may be a hanging pin extending to the horizontal direction. Alternatively, the hanging member may be a hanging piece **190** provided its end with a hook **189** as shown FIG. **47** (*c*).

Tenth Example

Other example which modified a structure of the engaging member and the hanging member of the bottom will be described.

As shown in FIG. **48**, an engaging member Cb comprises an annular plate **180***b* and an engaging piece **192** formed with a ball shape head **191** on the end projecting from the outer circumference of the plate **180***b*.

As shown in FIG. **48** (*b*), for an hanging member of the bottom **3**A, an engaging and inserting hole **194** is provided at the under surface of the left or right side bottom end wall **41**A of the bottom **3**A to have a spherical aperture **193** for engaging the head **191**.

As shown in FIG. **48** (*c*), an engaging and inserting hole **194***a* may be provided at the right side of the bottom end wall **41**A.

The function or effect of an engagement of the bottle neck and the bottom as well as the effect of the engaging piece and the engaging hole of the seventh example can be obtained.

Eleventh Example

The modified example in which an engaging member is arranged on the cap of the bottle will be described.

The bottle molded from same resin of the cap can be wasted with the cap after squeezing it.

In that case, the engaging member is arranged on the bottle to engage with the hanging member of the bottle bottom so as to keep the engagement of the bottle neck and the bottom.

In FIG. **49**, a cap Ba comprises a cap base Ba**1** and a cover Ba**2**.

A protruding ring **195** bulged from a cylinder wall is provided on the upper end circumference of a cover Ba**2**. An engaging ring **198** is provided in series on the outer circumference of the protruding ring **195** by a connecting piece **197** capable of cutting away easily from a hinge type connecting portion **196**.

The hanging member of the bottom may be a hanging bar as shown in FIG. **46** (*b*), and may be a hanging pin or a hanging piece respectively as shown in FIG. **47** (*b*) (*c*).

For obtaining the folded bottle, when the engaging ring **198** of the cap cover Ba**2** is to be pulled up from the axis of the connecting portion **196**, the connecting piece **197** is cut, thereby as shown in FIG. **49** (*b*), the engaging ring **198** is subject to be rotatable in respect of the cover Ba **2** via the connecting portion **196**.

In a manner described above, when the cover Ba**1** is so engaged that the connecting portion **196** is lead to the bottom side of the bottle and when the engaging ring is engaged with the hanging member of the bottle bottom, the engagement of the neck and the bottom of the bottle is kept through the cap Ba.

For the engaging member of the cap, the engaging ring **198** may be altered with the engaging piece with a spherical head as shown by the seventh example, which is protruded from the cap base or the cover, and the engaging hole with spherical aperture as shown in FIG. **44** (*b*) may be provided.

Further, the cap may be provided with a hinge type openable cover. Other than the members described above, the engaging member and the hook member as shown in the seventh to the tenth examples may be applicable.

EFFECT OF THE INVENTION

The bottle with a handle according to the present invention is composed as described hereinbefore and has following effect.

The handle can be easily squeezed by providing the squeezable and deformable portion to efficiently decrease the volume of the upper portion of the handle body.

Therefore, the bottle with the handle can be a flat bottle which volume is considerably decreased.

The flattened body of the bottle is further deformed to be curved by applying the bending force throughout the bottle, so that the flattened bottle can be further folded. When the hook of the hanging piece provided on the bottom wall is engaged with the engaging piece on the neck of the bottle or on the handle, a less volume folded bottle can be obtained.

Furthermore, in case of engaging the hook with the piece, the bottle is necessarily wasted separately from the cap, thereby different kinds of materials are capable of preventing from mixed to waste things.

Since the indication showing the sequence numbers and the operation of squeezing is formed in the predetermined place, the bottle can be easily squeezed to obtain a waste bottle by squeezing the bottle in accordance with the indications.

INDUSTRIAL APPLICABILITY

As described hereinbefore, the plastic bottle with the handle of the present invention has a predetermined intensity, and is thus useful for containing food liquid, drinking liquid, water and the like.

Further, when the bottle is wasted after using, it is easily to squeeze it to the flattened bottle folded into a considerably decreased volume thereof so as to have an efficiency of transporting waste things for an useful recycling the waste plastic.

What is claimed is:

1. A squeezable plastic bottle having a longitudinal axis that defines a longitudinal direction of the bottle and a handle that extends in the longitudinal direction between upper and lower end portions of the handle, the handle including a middle portion between the upper and lower end portions, wherein the middle portion of the handle includes a bending deformation portion in the handle that allows the middle portion of the handle to bend radially inwardly towards the longitudinal axis of the bottle, wherein the bending deformation portion of the handle comprises an

outwardly stepped wall that bulges outwardly beyond adjacent upper and lower end portions of the handle, and a bending portion.

2. The plastic bottle according to claim **1**, further comprising a bending rib disposed in a connecting portion between the handle and the bottle.

3. A squeezable plastic bottle having a longitudinal axis that defines a longitudinal direction of the bottle and comprising a neck, a body including a handle, and a bottom, wherein

said body comprises an upper body including the handle and a lower body,

the body is squeeze-deformable by disposing a bending rib in the lower body,

the handle extends in the longitudinal direction between upper and lower end portions of the handle, the handle including a middle portion between the upper and lower end portions, the handle including a bending deformation in the middle portion of the handle that allows the middle portion of the handle to bend radially inwardly towards the longitudinal axis of the body,

the upper body comprises a side wall and an inwardly curved wall facing to the handle, and

the upper body is bendable by forming bending ribs laterally extending on the inwardly curved wall and the side wall adjacent to said inwardly curved wall.

4. The rectangular plastic bottle according to claim **3**, wherein

said lower body has a rectangular cross section,

said lower body has an equilateral octagonal body wall, and comprises a left side wall, a right side wall, a front-left side wall, a rear-left side wall, a front-right side wall, a rear-right side wall, a front wall and a rear wall,

a lateral rib adjacent to the upper body is formed in the right side wall, the front-right side wall and the rear-right side wall at their upper ends,

the right side wall, the front-right side wall and the rear-right side wall are further formed with a lateral rib at their lower ends, and

each of the front-left side wall, the front-rear side wall, the front-right side wall and the rear-right side wall is formed with an inclined rib.

5. The plastic bottle according to claim **4**, wherein an indication showing a sequence for squeezing operation procedures for collapsing a bottle is attached in a predetermined place on the bottle.

6. The plastic bottle according to claim **3**, further comprising a bending rib disposed in a connecting portion between the handle and the bottle.

7. A squeezable plastic bottle having a longitudinal axis that defines a longitudinal direction of the bottle and comprising a neck, a body including a handle, and a bottom, wherein

said body comprises an upper body including the handle and a lower body,

the body is squeeze-deformable by disposing a bending rib in the lower body,

the handle extends in the longitudinal direction between upper and lower end portions of the handle, the handle including a middle portion between the upper and lower end portions, the handle including a bending deformation in the middle portion of the handle that allows the middle portion of the handle to bend radially inwardly towards the longitudinal axis of the body, and

wherein a hanging member is projected from the bottom and an engaging piece is provided on the upper body, said hanging member being matable upon collapse of the bottle with the engaging piece to retain the bottle in a collapsed state.

8. The plastic bottle according to claim **7**, wherein the engaging piece includes a hook protruded upwardly from the upper end portion of the handle, and the hanging member includes a hook projected from the bottom.

9. The plastic bottle according to claim **7**, wherein the engaging piece is provided on the neck or the shoulder of the body above the handle, and the hanging member includes a hook provided in the bottom.

10. The plastic bottle according to claim **7**, wherein the engaging piece is attached to the neck.

11. The plastic bottle according to claim **7**, wherein a cap provided with an engaging portion is attached to the neck of the bottle and forms said engaging piece.

12. The plastic bottle according to claim **11**, wherein an indication showing a sequence for squeezing operation procedures for collapsing a bottle is attached in a predetermined place on the bottle.

13. A squeezable plastic bottle having a longitudinal axis that defines a longitudinal direction of the bottle and comprising a neck, a body including a handle, and a bottom, wherein

said body comprises an upper body including the handle and a lower body,

the body is squeeze-deformable by disposing a bending rib in the lower body, and

the handle extends in the longitudinal direction between upper and lower end portions of the handle, the handle including a middle portion between the upper and lower end portions, the handle including a bending deformation in the middle portion of the handle that allows the middle portion of the handle to bend radially inwardly towards the longitudinal axis of the body,

wherein an indication showing a sequence for squeezing operation procedures for collapsing a bottle is attached in a predetermined place on the bottle.

14. A squeezable plastic bottle having a longitudinal axis that defines a longitudinal direction of the bottle and comprising a neck, a body including a handle, and a bottom, wherein

said body comprises an upper body including the handle and a lower body,

the body is squeeze-deformable by disposing a bending rib in the lower body, and

the handle extends in the longitudinal direction between upper and lower end portions of the handle, the handle including a middle portion between the upper and lower end portions, the handle including a bending deformation in the middle portion of the handle that allows the middle portion of the handle to bend radially inwardly towards the longitudinal axis of the body,

wherein the lower body has a circular cross section,

said lower body includes a circular cylindrical wall and a bottom circumferential wall,

said lower body is formed with longitudinal ribs on front and rear surfaces of the cylindrical wall respectively,

said lower body is formed with an arcuate rib connecting upper ends of said longitudinal ribs, and

said lower body is formed with inclined ribs and a lateral rib, each of said inclined ribs downwardly extending right or left to the bottom circumferential wall, said lateral rib extending in a right side circumferential wall, an upper end of each of the inclined ribs being spaced apart from a lower end of said longitudinal rib, each of

ends of said lateral rib being spaced apart from the lower end of said longitudinal rib.

15. The plastic bottle according to claim **14**, further comprising a bending rib disposed in a connecting portion between the handle and the bottle.

16. The plastic bottle according to claim **3**, wherein the lower body has a circular cross section, said upper body has a rectangular body circumferential wall, and comprises a shoulder, a left side wall, a front-left wall, a rear-left wall, a front side wall, a rear side wall and an inwardly curved wall, said lower body comprises a cylindrical wall having a circular cross section and a bottom circumferential wall,

said cylindrical wall is formed with longitudinal ribs, one of said longitudinal ribs coincides with a ridge line between the front-left wall and the front wall of said upper body and with a ridge line between the rear-left wall and the rear wall,

said circumferential wall is formed with lateral ribs connecting lower ends of said longitudinal ribs, and

said cylindrical wall is formed with a lateral rib adjacent to the circumferential wall in a right side, said lateral rib connecting upper ends of said longitudinal ribs.

17. A squeezable plastic bottle having a longitudinal axis that defines a longitudinal direction of the bottle and a handle that extends in the longitudinal direction between upper and lower end portions of the handle, the handle including a middle portion between the upper and lower end portions, wherein the middle portion of the handle includes a bending deformation portion in the handle that allows the middle portion of the handle to bend radially inwardly towards the longitudinal axis of the body, wherein the handle is integrally formed in one-piece with the body.

18. The plastic bottle according to claim **17**, further comprising a bending rib disposed in a connecting portion between the handle and the bottle.

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